



# **Definition of Alternatives Report**

**September 2008**

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# **1. Introduction**

The Maryland Transit Administration (MTA) is undertaking an Alternatives Analysis and Draft Environmental Impact Statement (AA/DEIS) to study means for addressing mobility and accessibility issues in the corridor between Bethesda and New Carrollton, in Montgomery and Prince George's Counties, Maryland, just north of the District of Columbia boundary. The study is considering a range of alternatives to improve east-west transit mobility in the 16-mile corridor that connects several major activity centers (Bethesda, Silver Spring, Takoma Park, Langley Park, College Park, and New Carrollton) and several Metrorail lines (both branches of the Metrorail Red Line (Bethesda and Silver Spring stations), the Green Line (College Park station), and the Orange Line (New Carrollton station)). This transit project is intended to provide enhanced transportation choices and improved accessibility for people in the corridor; to support local and county plans for economic development, community revitalization, and transit-oriented development; to improve system efficiency and intermodal connectivity; and to help address the region's air quality issues.

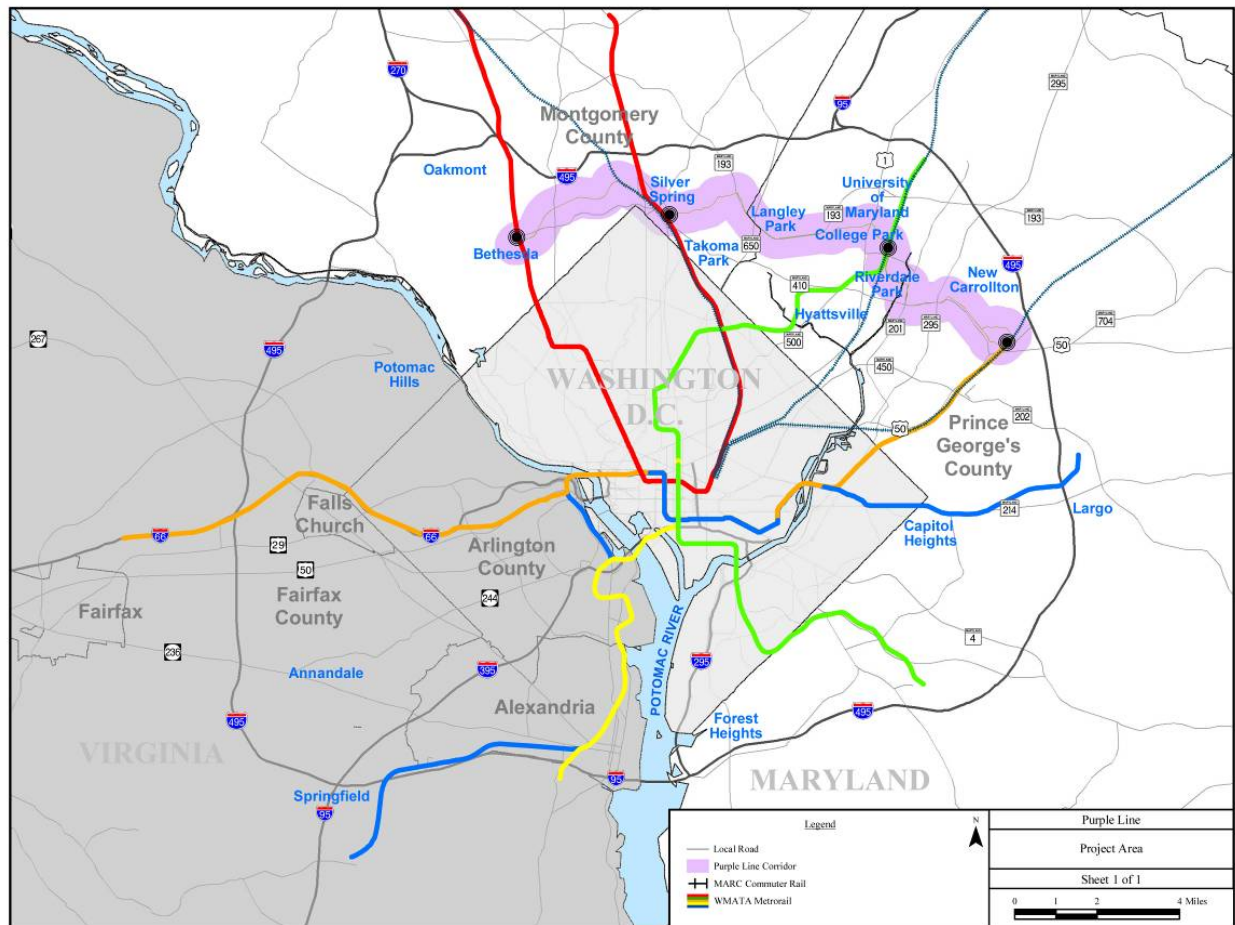
This technical report of the AA/DEIS provides a project overview, a project history, and a discussion of alternatives that were considered but dropped from further study. It describes the eight alternatives under consideration and presents a detailed description of the physical and operational aspects of the project alternatives being considered for the Purple Line. This report covers the No Build and the Transportation Systems Management (TSM) alternatives, as well as six Build Alternatives, and describes routing, stations, frequency and span of service, and supporting feeder bus service.

The Purple Line AA/DEIS examines the different alternatives, ranging from modest investments in shared-use roadways, to major investments in a dedicated guideway, grade-separated where necessary, to determine which mix of improvements achieves the greatest mobility and related benefits, balanced against costs and impacts on communities and the environment. Two modes, light rail transit (LRT) and bus rapid transit (BRT), were identified during the public scoping process as the modes most appropriate for this project.

## **1.1. Project Purpose and Need**

Changing land uses in the Washington metropolitan area have resulted in more suburb-to-suburb travel, while the existing transit system is oriented toward radial travel in and out of downtown Washington, DC. The only transit service available for east-west travel is bus service, which is slow and unreliable because it operates on congested roadways in the corridor between major activity centers. There is no efficient, reliable, and high capacity transit for east-west travel in the corridor. The Purple Line would serve transit patrons whose journey is solely east-west in the corridor, as well as those who want to access the existing north-south Metrorail system. The Purple Line would also provide a direct link to the Brunswick, Camden, and Penn Lines of the Maryland MARC commuter rail system and to Amtrak's Northeast Corridor service at New Carrollton (see Figure 1-1).

**Figure 1-1: Project Location**



The corridor has a sizeable population that already uses transit and contains some of the busiest transit routes and transfer areas in the Washington metropolitan area. Many communities in the corridor have a high percentage of households without a vehicle. Continued growth projections of population and employment in the corridor indicate that there will be a growing need for corridor transit improvements. The increasingly congested roadway system does not have adequate capacity to accommodate the existing average daily travel demand, and congestion on the existing routes is projected to worsen as traffic continues to grow through 2030. Many communities in the Purple Line Corridor are built out; therefore new road construction or road widening to increase capacity and reduce congestion are not feasible.

North-south rapid transit (Metrorail and MARC trains) serves parts of the corridor, but transit users who are not within walking distance of these rapid transit services must drive or use slow and unreliable buses that often operate over circuitous routes to access the transit stations. Faster and more reliable connections along the east-west Purple Line Corridor to the existing radial rail lines, bus routes, and activity centers within the corridor would improve mobility and

accessibility. Enhancing the connectivity of the transit system would improve transit efficiencies, making the system more attractive to a larger number of people.

In addition, a need exists to address poor air quality in the region. The region is classified as a maintenance area for CO, a nonattainment area for PM<sub>2.5</sub>, and a moderate nonattainment area for O<sub>3</sub>. The area must come into attainment for PM<sub>2.5</sub> and O<sub>3</sub> by April 2010 and June 2010, respectively. Changes to the existing transportation infrastructure will help in attaining the Federal air quality standards.

## **1.2. Project History**

The origins of an east-west transit route in this area can be traced to the former railroad freight line spur called the Georgetown Branch. This 11-mile railroad line owned by B & O Railroad carried coal and building supplies on a weekly train from Bethesda to Georgetown until service was discontinued in 1985. The National Park Service purchased the railroad right-of-way between Georgetown and the Washington, DC boundary, and the Montgomery County Council purchased the right-of-way from the Washington, DC boundary to the CSX Metropolitan Branch right-of-way under the National Trails Systems Act in 1988. The Maryland-National Capital Park and Planning Commission (M-NCPPC) was given jurisdiction from the Washington, DC line to Bethesda, and the Department of Public Works and Transportation was given jurisdiction of the right-of-way from Bethesda to Silver Spring for possible development of a “transitway,” light rail, or bus, in addition to the Capital Crescent Trail.

The *Georgetown Branch Master Plan Amendment* (November 1986) designated the right-of-way between Bethesda and the Metropolitan Branch as a public right-of-way intended to be used for public purposes, such as conservation, recreation, transportation, and utilities.

In 1986 Montgomery County issued a report entitled *East-West Transitway Feasibility Study*. This study was followed by the County’s *Georgetown Branch Corridor Study* in 1989. Both evaluated the use of the Georgetown Branch right-of-way as a transitway.

In October 1988, the Maryland Department of Transportation (MDOT) released *A Study of the Appropriateness and Applicability of Light Rail Transit in Maryland*, which determined that seven of the 24 study areas identified were potentially appropriate for LRT. Of the seven study areas, the Georgetown Branch project, from Bethesda to Silver Spring, was ranked as the most cost-effective.

In 1989, MDOT identified \$70 million of projected revenues within the six-year Consolidated Transportation Program (CTP) to be earmarked for the project. In winter 1990/spring 1991, the State legislature approved the FY 1990-1995 CTP which included \$70 million for the project – \$1.9 million in FY 1991 and \$3.8 million in FY 1992 for engineering and design. In May 1990, the MTA conducted further evaluations and cost estimates for the project. The results are summarized in the *Georgetown Branch Trolley/Trail Conceptual Report* (1990). In 1991, the project was suspended because the costs estimated in the 1990 study exceeded the amount allocated by the State.





A report by the Metropolitan Washington Council of Governments (MWCOC), *The Potential for Circumferential Transit in the Washington Region* (August 1993), assessed the potential of circumferential rail, bus, and high occupancy vehicle facilities to provide viable links between suburban residential, commercial, and employment centers to maintain mobility in the Washington metropolitan area. The report concluded that the pattern of suburban land activity inherent in 20-year forecasts would not provide a viable basis for circumferential rail transit along the Capital Beltway or along outer suburban corridors. It also identified the Georgetown Branch connection between the Bethesda and Silver Spring metro stations as the most promising circumferential rail linkage inside the Capital Beltway.

The MTA completed the *Georgetown Branch Transitway/Trail Major Investment Study/Draft Environmental Impact Statement (MIS/DEIS)* in 1996, which considered both a combined light rail and hiker-biker trail and a busway and trail to connect Bethesda to Silver Spring. The document was available for public review and comment on May 24, 1996, and a public hearing was held on June 26, 1996. A Final Environmental Impact Statement was never produced for this study.

In November 1998, the Montgomery County Council endorsed light rail as the preferred mode alternative for the Georgetown Branch, Bethesda to Silver Spring segment.

The incorporation of the Georgetown Branch into a larger Purple Line, envisioned to eventually circle Washington, DC, began with the *Capital Beltway/Purple Line Study* initiated by the Maryland State Highway Administration (SHA) and the MTA in 1996. The study shifted from an original focus on HOV solutions on the Capital Beltway to multimodal transportation improvements in the Capital Beltway corridor. This included the consideration of several heavy rail and light rail lines that extended along the 42-mile segment of the Capital Beltway in Maryland, from the American Legion Bridge to the Woodrow Wilson Bridge. The corridors included routes located along, outside, inside, and crossing the Capital Beltway. In all, six different corridors using either heavy rail (Metrorail) or light rail technology were considered. Of the *Capital Beltway/Purple Line Study* corridors, Options P2 (heavy rail) and P6 (light rail) included the Bethesda to New Carrollton segment. Completed in 2002, the *Capital Beltway/Purple Line Study* recommended the "Inner Purple Line" (inside the Beltway) as the priority transit corridor. The term "Purple Line" was adopted to be consistent with the Washington Metropolitan Area Transit Authority's (WMATA) practice of naming Metrorail routes by color.

In response to this study, a second project was initiated, the *Purple Line East, Silver Spring to New Carrollton*. This project was initiated by WMATA. Simultaneously the MTA began the preparation of a Supplemental DEIS for the Georgetown Branch. Subsequently the Georgetown Branch became known as the "western" segment of the Purple Line; the *Purple Line West, Bethesda to Silver Spring*.

In October 2001, Gov. Parris Glendening directed Transportation Secretary John D. Porcari to make planning, funding, and building the 16-mile P6 light rail project the State's top transit priority.





In March 2003, under the direction of the new governor, Robert Ehrlich, the two projects were combined and renamed the *Bi-County Transitway Project*. Transportation Secretary Robert Flanagan announced plans to explore another mode, bus rapid transit (BRT), which would use dedicated lanes on existing roadways to allow buses to move faster than automobile traffic and could be constructed at a lower cost than LRT.

In September 2003, The Federal Transit Administration (FTA) and the MTA published a Notice of Intent (NOI) that they would be preparing an Environmental Impact Statement in accordance to the National Environmental Policy Act (NEPA) of 1969, as amended, on the proposed Bi-County Transitway Project. This NOI extended the previous projects limits beyond Silver Spring to New Carrollton. In addition, MTA announced that it intended to seek Section 5309 New Starts funding for the project.

The MTA initiated a joint DEIS and Alternatives Analysis following FTA's Major Capital Projects policies and procedures.<sup>1</sup>

In January 2007, the project returned to its former name, the Purple Line; the name by which it had continued to be referred by the public and local stakeholders.

### **1.3. Alternatives Development Process**

The MTA has examined a wide range of modes and alignments throughout the long history of this project. In 2003, when the east and west portions of the project were combined and the MTA held a series of public scoping meetings to reinitiate the study, the mode choices were narrowed down to BRT and LRT. The MTA focused on determining the alignments that would best meet the purpose and need, while minimizing impacts and optimizing the service provided. As required by the FTA in an Alternatives Analysis, the MTA worked to develop alternatives that all met the purpose and need but had real differences. Three alternatives were established for each mode at varying levels of investment to compare the benefits and costs.

The alternatives definition has been an iterative process that involved extensive coordination with local stakeholders, including local planning agencies, major employers, elected officials, community groups, property owners, and local residents. The MTA held regular meetings throughout the study with a project team that included local planners, county agencies, and elected officials to ensure that the Purple Line was consistent with local goals and that the MTA was informed of local issues.

The MTA conducted an extensive public outreach process with local residents. The MTA maintained a project website, mailed newsletters to a mailing list of over 60,000 households, and held large public open houses. The MTA met with community and civic associations, agency and elected officials over 280 times between 2003 and 2008 to discuss the project and solicit input from local residents. Beyond this, the MTA developed a community engagement process

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<sup>1</sup>Federal Transit Administration, "New Starts Project Planning & Development," 8/21/07, [http://www.fta.dot.gov/planning/planning\\_environment\\_5221.html](http://www.fta.dot.gov/planning/planning_environment_5221.html), (10/29/07).



called “Community Focus Groups” in the fall of 2004. The MTA organized eight of these groups along the corridor to provide a forum for discussion with local residents on issues and concerns relative to their neighborhoods. The goal was to have small, geographically organized meetings focused on local neighborhood issues relative to the Purple Line. In some communities along the corridor the challenge was not getting people to come to community meetings, but getting a small enough number that would allow for a dialogue rather than presentations. A format was developed with the aid and support of the local jurisdictions. Comprised of representatives of local community and civic associations, these groups met regularly with project planners to discuss in detail local project plans. The focus groups proved to be an effective way to work with local communities. The MTA gained much valuable information at the meetings, both about community concerns and also about the local area. This information ranged from such issues as the details of the traffic circulation of local school buses to double parking by delivery vans on narrow commercial streets. In some cases, alignments were dropped; in others they were modified, based on input received at these meetings. This information allowed the MTA to better design the project and develop plans to address community concerns.

Section 1.2 described the history of the project and its planning up until the definition of the project at the public scoping in September 2003.

### ***1.3.1. Scoping***

Public and agency scoping for the Purple Line was held in September 2003. The scoping process began with public notification of four public meetings. The meetings were in the Takoma/Langley area, Silver Spring, Bethesda, and College Park on four evenings in mid-September 2003. More than 350 comments were submitted through the scoping process. Comments covered a broad range of topics, both on general alignment issues and specific routes. Many stated approval or disapproval of the project as a whole. Mode and alignment were the categories that received the most comments.

Scoping for the resource agencies was held September 25, 2003. Invitation letters were extended to 22 regulatory and public agencies. Agency representatives in attendance included:

- Federal Transit Administration
- Federal Highway Administration
- U.S. National Marine Fisheries
- U.S. Environmental Protection Agency
- U.S. Army Corps of Engineers
- Washington Metropolitan Area Transit Authority
- Metropolitan Washington Council of Governments
- Maryland Historical Trust
- Maryland Department of Natural Resources



- Maryland State Highway Administration
- Maryland Department of Planning
- Maryland Department of the Environment
- Maryland-National Capital Park and Planning Commission – Montgomery County
- Maryland-National Capital Park and Planning Commission – Prince George’s County
- Prince George’s County Department of Public Works and Transportation

Agency representatives asked questions and commented on a variety of topics, including fuel type usage for bus vs. light rail alternatives, quality of service, alternative modes being considered (other than LRT and BRT), additional proposed stations in Prince George’s County, and engineering issues. Agencies were encouraged to provide comments at the meeting and to submit written comments.

An agency field tour was conducted on December 2, 2003. This helped agency representatives further understand the project and gave them the opportunity to see the corridor and discuss issues.

Three agency meetings were held over the next three years in conjunction with several of the Project Team meetings. The dates of these meetings were October 1, 2004, April 29, 2005, and April 7, 2006. All meetings provided project updates. The October 2004 meeting focused on the screening process used to evaluate the alignments. The April 2005 meeting gave a detailed presentation of the alignments being carried forward at that point. The April 2006 meeting reviewed the status of the environmental analysis and the need for a second maintenance and storage site.

As the alternatives were further refined, additional potential station locations were identified and more detailed information on potential impacts was developed. A second agency field tour was conducted on November 8, 2007. This gave agency representatives another opportunity to discuss project-related issues.

In addition to the larger agency coordination meetings and field reviews, individual coordination was conducted throughout the planning study, as appropriate.

A wide range of alternatives were identified and suggested during the scoping process. In considering these alternatives, the MTA assessed alternatives for reasonableness and relevance to address the project’s purpose and need. Alternatives identified during the scoping process that did not support the purpose and need for the Purple Line were not considered “reasonable alternatives” as discussed in the FTA regulations implementing NEPA (23 CFR 771.123). Alternatives that did not pass the reasonableness standard were eliminated from further consideration in the AA/DEIS.



## 1.4. Modes

Two transit modes, heavy rail and monorail, were suggested during scoping and not carried forward for detailed study. In the previously completed *Capital Beltway/Purple Line Study – Findings and Recommendation Report (2003)*, heavy rail (Metrorail) and monorail were eliminated from consideration for the Purple Line corridor due to prohibitive costs and the availability of other viable alternatives.

A heavy rail alternative was eliminated from consideration for the Bethesda to Silver Spring segment in the 1996 *Georgetown Branch Transitway/Trail MIS/DEIS* due to excessive costs projections from the *East West Transitway Feasibility Study*. In July 2000 the MTA reexamined the comparative costs of several alignments between Bethesda and Silver Spring, including double track along the Georgetown Branch right-of-way and double track underground. This report projected the underground costs of approximately \$926M and the surface alignment \$292M; because of the scale of the cost differential the MTA has not included heavy rail in the study.

The MTA has concluded that monorail technology does not offer appropriate solutions when compared to BRT and LRT. Comparing capital costs for recently constructed LRT and BRT systems around the country to a monorail system similar to the system developed in Las Vegas, Nevada, indicates that a monorail would not likely offer any cost savings. In addition, a monorail would not likely be able to meet the capacity needs associated with this corridor. Higher capacity monorail systems could be constructed, but because the larger vehicles must straddle a larger beam, heavier structures would have to be built and, as a result, turning radii would need to be larger creating substantial visual and property impacts on adjacent communities.

Neither of these modes meets the goal of a cost-effective transit alternative that is rapid, reliable, and environmentally friendly; therefore, the MTA has eliminated monorail and heavy rail alternatives from the study.

The two transit modes are being considered for the Build Alternatives, BRT and LRT are defined below.

Bus rapid transit is a mode of transportation that has characteristics in common with both conventional bus operations and LRT. BRT looks and feels much like a railcar but uses rubber wheeled vehicles. It can operate either on city streets or in a separate busway. BRT is generally faster than traditional local bus service. Like a rail system it has permanent stations, services, and amenities. Vehicles are typically fueled with low emission hybrid electric motors or Compressed Natural Gas. BRT vehicles typically are low floor, making them easier to board, and often have several doors for faster boarding.

Features generally associated with a BRT system include signal priority at intersections, queue jump lanes, and off board fare collection. One advantage of BRT service is that the buses are not

restricted to a specially constructed guideway but can operate on regular streets to provide “one seat” feeder bus service.

BRT is new to Maryland, but not to many communities around the world. American cities such as Pittsburgh and Seattle have long benefited from BRT. BRT systems can provide the following:

- Lower capital cost
- Cost-effective alternatives
- High-quality service
- High-performance rapid transit service that can be quickly implemented
- Medium to high capacity service

Light rail transit is an electric railway system that can operate single cars or short trains. LRT can operate in mixed traffic, like traditional streetcars, or in a separate right-of-way. When light rail operates on existing streets in dedicated rights-of-way, signal priority can be used to ensure that the LRT vehicles are not delayed by traffic signals.

A growing number of cities in the United States have LRT systems, including Dallas, Portland, Denver, St. Louis, and San Diego. LRT systems can provide the following:

- Cost-effective alternatives
- High-quality service
- High-performance rapid transit services
- High capacity service

For each mode, low, medium, and high investment alignment alternatives are being evaluated, representing increasing levels of capital investment. All of the Build Alternatives extend the full length between the Bethesda Metro Station and the New Carrollton Metro Station. The intent is that these alternatives while all serving the same markets and providing improvements in the quality of the transit service through improved operating speeds and reliability, vary in the type of running way and amounts of grade separation (tunnel or aerial structure).

#### ***1.4.1. Types of Guideway***

There are a number of guideway types that the alternatives will utilize. With the exception of the No Build, each alternative uses multiple lane configurations on surface streets, and may include tunnel and elevated segments as well. The three basic types of guideway used in the alternatives are as follows:

- *Shared-use lanes* – When transit vehicles travel in mixed traffic, they are subject to the same speed restrictions and congestion as general traffic. Current bus service in the corridor makes use of shared-use lanes, as does the No Build. Where there is little



congestion, limited right-of-way, or high monetary or environmental costs, shared-use lanes can be the best option.

- *Dedicated Surface Lanes* – There are number of ways to dedicate surface lanes on existing roads for transit use. Depending on available right-of-way, traffic volumes, parking needs, and alternative design, transit vehicles would travel either in the curb lane or the median of a roadway. General traffic would be able to cross dedicated lanes.
- *Exclusive Guideway* (tunnels, transit-only lanes, and elevated segments) – Where BRT or LRT vehicles travel in tunnels, elevated segments, or along new alignment, the guideway would be for the exclusive use of transit vehicles. General traffic would not be permitted access to these guideways.

The various dedicated lane configurations have different operating characteristics and different impacts on local traffic and parking. These are outlined below, along with information on the use of traffic signals to optimize transit speeds.

Providing a dedicated lane for transit in the curb lane can be done on one-way streets as well as two-way streets. To avoid the problem of cars turning right in front of buses that are not turning, the curb lane configurations allow for use of the lanes by vehicles making right turns. For this reason, barriers would not be used to separate bus traffic from other traffic. Parking in the curb lane would be prohibited when a street is operating with a dedicated curb lane for transit.

BRT and LRT can also be run in the median of two-way streets. Stations must be located in the median as well, which can require additional right-of-way. Median-lane transit can make turning movements difficult, as left-turning vehicles must cross over dedicated transit lanes unless left turn lanes are provided or left turns are permitted from the transit lane.

#### ***1.4.2. Transit Signal Priority***

Two types of signal priority are proposed to improve transit operating speeds and service reliability. In addition, a typical use of protected right turns is desirable when using curb lanes marked for buses and right turning traffic only, to clear the lane as quickly as possible.

- *Extended green times* - the green phase is extended for 5-10 seconds if a detector indicates a bus approaching the signal. This type of signal priority can significantly improve travel times by reducing the number of signals where the bus has to stop. The 5-10 seconds would be deducted from the cross-street green time.
- *Advance green for transit queue jump/dedicated lanes* - The signal would provide a special green to allow the transit vehicle to proceed in advance of general traffic. This is only necessary when the bus does not have a dedicated lane on the other side of the intersection or could not otherwise proceed with general through-traffic. Such situations include when a bus in a queue jump lane must merge with general traffic on the other side of the intersection, or when the bus lanes turn left onto a roadway with shared lanes.

Most of the Purple Line alignments would run along existing roadway rights-of-way. Medium and High Investment Alternatives would have some tunnel sections that would not necessarily



follow roadway alignments. All Build Alternatives use the former Georgetown Branch right-of-way, (often referred to as the Master Plan alignment because of its adoption in the *Georgetown Branch Master Plan* in 1986); in combination with a one-mile segment along the CSX Metropolitan Branch railroad right-of-way between Bethesda and Silver Spring; however, the Low Investment BRT Alternative only uses the portion of the Georgetown Branch Right-of-way east of Jones Mill Road to the CSX Metropolitan Branch right-of-way.

## **1.5. Alignments Dropped from Further Study**

Several specific alignments initially suggested received substantial negative feedback from the public as well as city and county councils during the scoping process.

The segment of MD 410, extending east from Bethesda and continuing east of Silver Spring, was not carried forward due to several factors, including a very narrow right-of-way that would have extensive property impacts, grades that were very steep and on which it would be difficult for light rail transit to operate, opposition from a large segment of the public, and a City of Takoma Park resolution in October 2003 that recommended elimination of this alignment from further study. In addition, this alignment east of Silver Spring would not have served the Flower Avenue area, which Montgomery County has targeted for improved transit to support economic development and revitalization.

An underground alignment extending from Paint Branch Parkway and Good Luck Road to Riverdale Road along Brier Ditch was eliminated from further consideration due to concerns from the U.S. Army Corps of Engineers about impacts to wetlands in the area.

Another alignment presented at the scoping meetings that received strong opposition from the surrounding community and the City of New Carrollton was an alignment that extended from Riverdale Road and continued behind the New Carrollton Mall and Shopping Center. This alignment was not carried forward due to this opposition and the potential for greater community impacts than the other alignments under study.

The screening process was iterative throughout the study and included consideration of natural and social environmental impacts, preliminary cost estimates, and input from the public and agencies. As described earlier, the Purple Line study had an extensive public outreach program and met regularly with local community representatives and local jurisdictions. The alignments were refined extensively based on this input.

An example of this type of refinement was the modification of the original Silver Spring/Thayer Avenue design option. This alignment originally cut through the center of Montgomery County Lot #3 which the County had planned for redevelopment. The MTA coordinated with the County and the developer to shift the alignment so as not to preclude the proposed development.

A number of other alternatives were also dropped from further consideration as part of the AA/DEIS process. The following is a brief discussion of why these alignment options have been dropped from further consideration.





### ***1.5.1. The Metrorail (or Purple Line) Loop***

The Metrorail Loop alignment was proposed by Montgomery County Executive Duncan in January 2003. This proposed Metrorail (heavy rail) alignment would have extended from the existing Medical Center Metrorail Station in Bethesda north via a tunnel under the Capital Beltway and along the north side of the Beltway, primarily on an aerial structure. It would then cross back over the Beltway, continuing south along the Metropolitan Branch CSX corridor either in a retained cut or in a tunnel to the Silver Spring Transit Center. This alignment would be a continuation of the Metrorail Red Line and, as such, it would have been heavy rail and would not have continued past the Silver Spring Transit Center in the same mode.

Both the MTA and M-NCPPC carried out assessments of this proposed alignment.

The MTA concluded that while the Metrorail Loop could improve operations and provide redundancy for the Metrorail Red Line; these advantages would not have applied to the Purple Line corridor as a whole. Implementation of the Metrorail Loop would not have addressed the issues of system connectivity, mobility, accessibility, and efficiency for the entire corridor that are part of the Purple Line Purpose and Need. Passengers traveling between the Metrorail Loop and destinations east of Silver Spring would have been required to transfer from the Metrorail Loop to LRT or BRT to complete their travel farther east. This alignment would not have provided continuous service for destinations between Bethesda and New Carrollton and would not have addressed the issues of an inadequate and slow-moving transportation network for east-west travel between Bethesda and New Carrollton. Further, serious natural and human environmental impacts are associated with the Metrorail Loop option. This alignment would have required acquisition of right-of-way from Rock Creek Park along the Capital Beltway. This alternative would have also required property from approximately 25 residences along the CSX right-of-way. The Metrorail Loop would not have supported local plans for economic and community development west of Silver Spring because there would be no stations at the Chevy Chase and Lyttonsville communities. Moreover, this alignment would have been a less cost-effective solution to addressing the transportation problems and needs associated with the Purple Line corridor compared to a BRT or LRT alternative for the entire 16-mile corridor. The *Metrorail Loop Proposal Alignment Evaluation* is included as an appendix to this report.

In January 2003, M-NCPPC issued a report recommending that the Metrorail Loop not be carried forward for further detailed study. While recognizing the benefits to the existing Metro rail system, M-NCPPC recommended that the proposal not be carried forward due to a number of considerations. These included: the high cost of the project (estimated at twice that of the Purple Line), lower cost-effectiveness, greater impacts to the natural environment, the inability to serve communities between Bethesda and Silver Spring, and impact to the outer Red Line stations (stations north of Medical Center and Silver Spring). The *M-NCPPC Purple Line Loop* memorandum is included as an appendix to this report.

### ***1.5.2. LRT on Jones Bridge Road***

The availability of the Georgetown Branch right-of-way, owned by Montgomery County and designated for use as a transitway and trail, and the potential to build a transitway within a nearly

exclusive operating environment with few grade crossings, provide the opportunity for a transit service unimpeded by traffic conflicts and therefore allowing for reliable service and faster speeds between Bethesda and Silver Spring. However, the capital cost of constructing a transitway and trail along this alignment is relatively high, so a lower cost BRT alternative using Jones Bridge Road is being considered between Bethesda and Rock Creek. This alternative consists of in-street running BRT along Jones Bridge Road and Jones Mill Road and along Woodmont Avenue west of Jones Bridge Road, connecting to downtown Bethesda. For BRT this is indeed lower cost, since the buses would be operating on existing roadways; however, light rail service along Jones Bridge Road would require reconstruction of the street for the installation of rails and catenary, and therefore would not offer the same savings over the Master Plan alignment. For this reason, Jones Bridge Road is not being considered for light rail.

### ***1.5.3. BRT and LRT on Brookville Road***

An alternative along Brookville Road had been proposed as a lower cost alternative, particularly for BRT which could operate on the existing road. However the need to construct a transitway from Brookville Road along the CSX tracks would have negated the savings and resulted in additional property impacts. In addition, the Brookville Road alignment would have slower travel speeds and potential traffic conflicts with existing traffic for both LRT and BRT. The alignment also interfered with the layout of the maintenance and storage facility on Brookville Road.

### ***1.5.4. 16<sup>th</sup> Street to East West Highway to Colesville Road (BRT only)***

In this low investment BRT option the buses would leave the CSX corridor at 16<sup>th</sup> Street and continue on 16<sup>th</sup> to East West Highway and then on to Colesville Road to Wayne Avenue. This option had very poor travel times because of high levels of traffic and several major intersections. The Spring Street to 2<sup>nd</sup> Avenue at grade option would provide much faster service with similar costs.

### ***1.5.5. BRT and LRT from CSX at Spring Street to 2<sup>nd</sup> Avenue with an Aerial Crossing of Wayne Avenue***

The LRT option required an aerial structure over Colesville Road because of steep grades on 2<sup>nd</sup> Avenue. This alignment had no direct connection with the Silver Spring Transit Center and would have required passengers to walk through or around the proposed private development to reach the transit center. This poor connectivity is contrary to the goals of the Purple Line. The structure would have had high costs, impacts to the residences on 2<sup>nd</sup> Avenue, visual impacts to downtown Silver Spring, and traffic impacts to access into the Metro Plaza building. The BRT aerial crossing of Colesville Road along 2<sup>nd</sup> Avenue was also dropped due to high costs and impacts to adjacent properties.

### ***1.5.6. Tunnel from Sligo Avenue and Piney Branch Road Directly to Takoma/Langley Crossroads***

This alignment followed Sligo Avenue to Piney Branch Road where it descended into a tunnel along the alignment of Park Valley Road and emerged near the intersection of University



Boulevard and Anne Street. It would have been aligned to have a station near Columbia Union College and Washington Adventist Hospital in Takoma Park. This alignment was dropped because it did not support the Montgomery County Master Plans for economic redevelopment of the Flower Avenue/Long Branch commercial area because it did not have a station in the neighborhood. The proposed Arliss station of the retained alternatives would serve this area. In addition, this alignment would be very costly compared to other alternatives. At the public meetings there was almost no public support for a station near the college and the hospital along this alignment option.

#### ***1.5.7. Sligo Avenue in East Silver Spring, both at Grade, and in Tunnel***

The Purple Line alignment on Sligo Avenue at grade would have poor transit operations and major traffic impacts requiring either operation in shared lanes or one-way traffic. The traffic and parking impacts would have adversely impacted the 30 small businesses along this street. The narrow right-of-way would have necessitated significant property impacts and easements. The Wayne Avenue at grade option provided a similar low investment surface option that would operate far better and have fewer community impacts.

A tunnel option under Sligo Avenue was also dropped. This was a high-cost option and would have had required significant property easements. Tunnel segments of shorter lengths and less cost could be used more effectively on the Wayne Avenue or Silver Spring/Thayer alignments.

#### ***1.5.8. All Alignments along Colesville Road from the Silver Spring Transit Center***

Several alignments were presented at scoping that used Colesville Road north from the Silver Spring Transit Center. One alignment followed Colesville Road north to University Boulevard in Four Corners and turned south at the signalized intersection at University Boulevard. Another alignment followed Colesville Road north to East Franklin Avenue and traveled east to Flower Avenue and then south to Piney Branch Road to University Boulevard. A third alignment followed Colesville Road to East Franklin Avenue and then to University Boulevard.

Colesville Road is six lanes wide with a reversible center lane. It is a heavily used major arterial. Surrounding land uses are generally single-family residential, except in the Silver Spring CBD. The extremely heavy traffic on Colesville Road and constrained right-of-way would make it very difficult to implement dedicated or exclusive lanes for transit. In the 1990s, the Montgomery County Department of Transportation conducted a feasibility study for a busway on US 29 (Colesville Road).<sup>2</sup> After this study, both the Montgomery County Council and M-NCPPC recommended that US 29 not be considered for either a busway or LRT. Because this alignment extends north above the Purple Line corridor and then comes south again before continuing east, it adds more than a mile of additional distance to the alignment. As a result, this alignment significantly lengthens the trip time and increases the operational cost, both of which are counterproductive to the project's goal of providing rapid transit service east-west in the corridor. For these reasons, this alignment is not being retained for detailed study.

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<sup>2</sup> Montgomery County Department of Transportation, *US 29 Busway Feasibility Study*, 1996.

#### ***1.5.9. Longer Tunnels under Wayne Avenue***

Communities members concerned about the impacts of a tunnel portal on Wayne Avenue near Dale Drive requested that the MTA evaluate a longer tunnel. Two tunnels were considered, both alignments descending into tunnel from Silver Spring Avenue west of Georgia Avenue. The first tunnel considered would have passed under Sligo Creek. However, because of the depth required to tunnel under the creek, and the rapidly rising topography east of the creek, this tunnel would not have been able to return to the surface until the alignment was on Piney Branch Road, at Barron Street. This would have been extremely expensive and would not have provided meaningful travel time benefits, therefore would have had substantial negative impacts to the cost-effectiveness of the project. The cost of underground stations is likewise very high, further escalating the cost of this option. For this reason this option was dropped. A second, shorter tunnel with a portal on Wayne Avenue between Sligo Creek and Mansfield Street was evaluated in an effort to find a more financially feasible option. This option, while less costly, would have had major adverse impacts to the residences on the south side of Wayne Avenue. These houses are above the grade of the roadway, with short steep driveways. The street widening required for a tunnel portal would have required property acquisitions from the front yards and driveways of these houses, and retaining walls in these yards. This option also required property from Sligo Creek Park. This tunnel did not provide any travel time benefits, and added to the project cost. For both tunnel options the addition of stations was an issue. The high cost of underground stations weighed against their inclusion, but if stations were not included in these alignments the communities would not benefit from the project, and ridership would be lower. It was determined that these tunnels did not provide sufficient benefit and had such a detrimental effect on the cost of the project that further study was not justified.

#### ***1.5.10. University of Maryland Campus Alignment on Paint Branch Drive***

This alignment followed University Boulevard northeast to Paint Branch Drive. At Paint Branch Drive it turned south, passing the University of Maryland's Comcast Sports Arena, and joined Campus Drive on the eastern edge of campus. While this alignment would have served the sports arena well and would have been heavily used during special events, it did not serve the central core of the University of Maryland campus. The University of Maryland is quite large and a central station location is more convenient for the greatest number of people.

#### ***1.5.11. Paint Branch Parkway to Kenilworth Avenue***

This alignment continued east from River Road, just north of the College Park Metro Station on Paint Branch Parkway, to Kenilworth Avenue. This alignment did not have good connectivity to the Metro Station and did not serve the University of Maryland's research park, M Square, currently under development along River Road. This research park will be a major ridership market.

In addition, Paint Branch Parkway is surrounded by wetlands and parklands. As a result, this alignment option would have had much greater environmental impacts and Section 4(f) issues than the River Road alignment option. Section 4(f) of the Department of Transportation Act of 1966 (49 USC 303) declares a national policy "to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites." Section



4(f) of the DOT Act stipulated that the FTA cannot approve the use of land from a significant publicly- owned public park, recreation area, wildlife or waterfowl refuge, or any significant historic site unless the following conditions apply:

- There is no feasible and prudent alternative to the use of land.
- The action includes all possible planning to minimize harm to the property resulting from use.

River Road provides a feasible and prudent alternative to the use of Paint Branch Parkway, so this alignment was dropped from further study.

#### ***1.5.12. Paint Branch Parkway to CSX Corridor to East West Highway***

This alignment paralleled the CSX and WMATA alignments south from the College Park Metro Station and turned east on East West Highway. This alignment required the use of the CSX right-of-way. CSX has stringent separation requirements that would have added considerably to the project cost. It also did not serve the University's M Square Research Park currently under construction along River Road.

#### ***1.5.13. River Road to Lafayette Road serving Riverdale MARC Station***

The MTA evaluated several alignments which went parallel to the CSX tracks along Lafayette Road to the Riverdale Station of the Camden MARC line before turning left onto East West Highway. While it provided connectivity to the Riverdale Station, and could have supported economic development at this location, the alignment was constrained by the existing residential development and narrow roadways. The engineering constraints added between four and eight minutes of travel time between College Park and Riverdale Park compared to the at grade and tunnel options.

#### ***1.5.14. River Road to 51<sup>st</sup> Avenue to East West Highway***

This surface alignment followed River Road from the College Park Metro Station and proceeded on a new surface alignment south connecting to 51<sup>st</sup> Avenue to East West Highway. This alignment presented Section 4(f) issues with impacts to Anacostia River Park. 51<sup>st</sup> Street is a small residential street, and an alignment on it would have had major community impacts. These impacts are easily avoidable by using other alignments; therefore this alignment was dropped from further consideration.

#### ***1.5.15. Tuckerman Street between Kenilworth Avenue and Veterans Parkway***

This alignment began at the intersection of Kenilworth Avenue and River Road and proceeded east in a tunnel under Tuckerman Street with a narrow right-of-way under residences and commercial and county structures, and then crossed under East West Highway and emerged on Veterans Parkway. This alignment was dropped because of high costs and many required underground easements, and because it bypassed an important transit stop at Kenilworth Avenue and East West Highway.

#### ***1.5.16. Riverdale Road from Veterans Parkway to Annapolis Road***

The Riverdale Road alignment was an option for only BRT because of the steep grades. The alignment had travel times approximately 40 percent longer than those for Veterans Parkway because of the cross streets and the narrower, tight curves of the roadway. Unlike Veterans Parkway, there were potential residential impacts. This option was strongly opposed by both residents of the area and the City of New Carrollton. Given the existence of a viable surface alternative on Veterans Parkway, this alignment was dropped.

#### ***1.5.17. Annapolis Road to Emerson Place***

This alignment option began at Annapolis Road and Harkins Road, but left Harkins Road to pass to the west of the IRS building and parking structure, then continued on Emerson Place. This alignment was dropped because of its greater potential for community impacts and because it was not substantially different from the Harkins Road alignment, which has few impacts to local residents. This alignment was opposed by the West Lanham Hills community.



## **2. Alternatives Retained for Detailed Study**

The Purple Line study is evaluating a No Build Alternative, a Transportation Management System Alternative, and six Build Alternatives.

### **2.1. Alternative 1 – No Build Alternative**

Federal regulations require that a No Build Alternative be evaluated in an Environmental Impact Statement. For NEPA purposes, the No Build Alternative is the baseline against which the other alternatives are compared for the extent of environmental and community impacts. The No Build Alternative assumes that no new improvements would be made to the transportation system in the study corridor, other than those that are currently in local and regional transportation plans and that have identified funds for implementation by 2030. Thus it consists of the transit service levels, highway networks, traffic volumes, and forecasted demographics for the horizon year of 2030 that are assumed in the Constrained Long Range Plan (CLRP) of the local metropolitan planning organization (MWCOG, in this case).

The western segment of the Purple Line, the former Purple Line West, Bethesda to Silver Spring, is in the CLRP as a project; the eastern portion, Purple Line East, Silver Spring to New Carrollton, is in the CLRP as a study. However, the Purple Line has not been assumed as part of the future transportation network in the travel forecasting model.

The following two projects in the CLRP are major projects in Maryland, but not in the Purple Line corridor.

- The Intercounty Connector is the major highway project in the area and is not expected to have a measurable impact on travel within the Purple Line corridor as it serves different travel markets. Likewise, planned US 29 intersection changes are also not expected to have an impact on the Purple Line.
- The Corridor Cities Transitway from Shady Grove to COMSAT is a committed study, but it is sufficiently far from the Purple Line that there is not expected to be any synergy between the two. It should be noted that the Corridor Cities Transitway has not been included in the future transportation network in the travel forecasting model.

Highway, transit, pedestrian, and bicycle projects and studies in the Purple Line corridor included in the Maryland Consolidated Transportation Program (FY 2007-2012) within the corridor are as follows:

- US 1 (Baltimore Avenue): Reconstruct US 1 between College Avenue and Sunnyside Avenue to improve traffic operations, pedestrian circulation, and safety; it would also accommodate planned revitalization within College Park (project)
- New Hampshire Avenue/University Boulevard: Streetscape and safety improvements for New Hampshire Avenue from Holton Lane to Merrimac Drive and University Boulevard





from 800 feet west of New Hampshire Avenue to 800 feet east of New Hampshire Avenue (project)

- Construction of the Silver Spring Green Trail, an 8-foot-wide bicycle/pedestrian trail on Wayne Avenue from the Silver Spring CBD to Sligo Creek Parkway (project)
- Bethesda Bikeway and Pedestrian Facilities, streetscape improvements (project)
- College Park Trolley Trail, construct shared-use path (project)
- I-95/I-495, Capital Beltway, from American Legion Bridge to Woodrow Wilson Bridge (study)
- University of Maryland Connector, I-95/495 to University of Maryland (study)
- Widening of Kenilworth Avenue from four to six lanes north from River Road to Pontiac Street (project)

Other committed projects in the Purple Line corridor include the following:

- Construction of the Silver Spring Transit Center. This project provides a fully integrated transit center at the Silver Spring Metrorail Station. It includes construction of bus bays for Metrobus and Ride On, an intercity bus facility, a taxi queue area, a kiss-and-ride facility, and a MARC ticketing office. Provision has also been made for the Purple Line and a hiker-biker trail.
- Construction of the Takoma/Langley Transit Center. The project is a joint effort between MTA and SHA. It will include pedestrian safety, roadway and intersection improvements, new sidewalks and crosswalks, and the provision of shelter for patrons awaiting buses. The transit center will be on the northwest corner of the University Boulevard and New Hampshire Avenue intersection in Langley Park. This transit center would be a station on the Purple Line.
- A study for construction of a new entrance to the Bethesda Metro Station mezzanine at the south end of the platform.

WMATA is currently pursuing additional joint development projects at the College Park and New Carrollton Metro Stations. These projects will be mixed-use developments that will take advantage of the metro stations to provide enhanced accessibility. The market for transit at these stations is expected to grow.

**Implications of the Defense Base Realignment and Closure Process.** When the Base Realignment and Closure (BRAC) Commission decided to close or combine aging bases nationwide, the State of Maryland was a primary recipient of employment from bases closing in other areas. Fort Meade, Aberdeen Proving Ground, Fort Dietrich, Andrews Air Force Base, and the National Naval Medical Center are expected to grow by 20,000 employees when BRAC is fully implemented in 2011. The recent decision to close Walter Reed Army Hospital and move a large number of staff and services to the National Naval Medical Center under BRAC will create a slightly larger market for transit at the Bethesda and National Institutes of Health (NIH) Metro Stations. The shift of 1,750 jobs from Walter Reed Army Medical Center in northeast



Washington, DC to National Naval Medical Center (NNMC) is expected to change commuting patterns in the near term for the positions that are being transferred. The actions noted in BRAC identify a changing picture of employment and visitor trips to the new combined medical center being planned on the site of the NNMC in Bethesda. The NNMC anticipates an increase of approximately 2,200 to 2,500 employees<sup>3</sup> of which an estimated 30 to 50 new riders would use the Purple Line.

The Purple Line AA/DEIS used MWCOG Round 7.0 2030 land use forecasts for employment, households and population in the analysis. The assumed growth for these items was based on normal growth assumptions for each zone in the region. A concern was raised about the implications of this change on the long-term assumptions for this project. However, given the scale of the expected growth excluding the BRAC changes, analysis of the changing trip patterns for the 2030 horizon year indicates that the effects of BRAC will be negligible.

The Bethesda area exists today and in the future as a major employment and population center exclusive of the BRAC changes. Combined employment around the Medical Center Metro Station is expected to grow by over 6,000 jobs to 2030 and population is expected to grow by approximately 700 in that time. The Bethesda CBD is expected to grow by 5,000 jobs and show a population increase of over 12,000 residences in that same period. The BRAC changes, while large, are a small percentage of the expected 72,000 jobs in the entire Bethesda CBD - Medical Center area in 2030.

Therefore, given the access afforded by Purple Line alternatives along the Master Plan alignment and connecting the Metrorail Red Line to the Medical Center Station, the impacts of BRAC on travel in the Bethesda area are notable more for the additional delays expected on area roadways than for the potential contributions to Purple Line ridership.

However, in response to community concerns about the need to better serve the Medical Center area two variations of the Medium BRT Alternative have been proposed. These are described in *Section 2.3, Alternative 4 – Medium Investment BRT*.

A detailed analysis of the impacts of BRAC is presented in Appendix C.

### ***2.1.1. Existing Transit Service***

Table 2-1 lists the existing transit services operating east-west within the corridor and their general characteristics. Existing transit consists of several overlapping or interconnecting routes, as shown in Figure 2-1. WMATA operates regional routes, those that are inter-jurisdictional, while each of the counties operates local routes.

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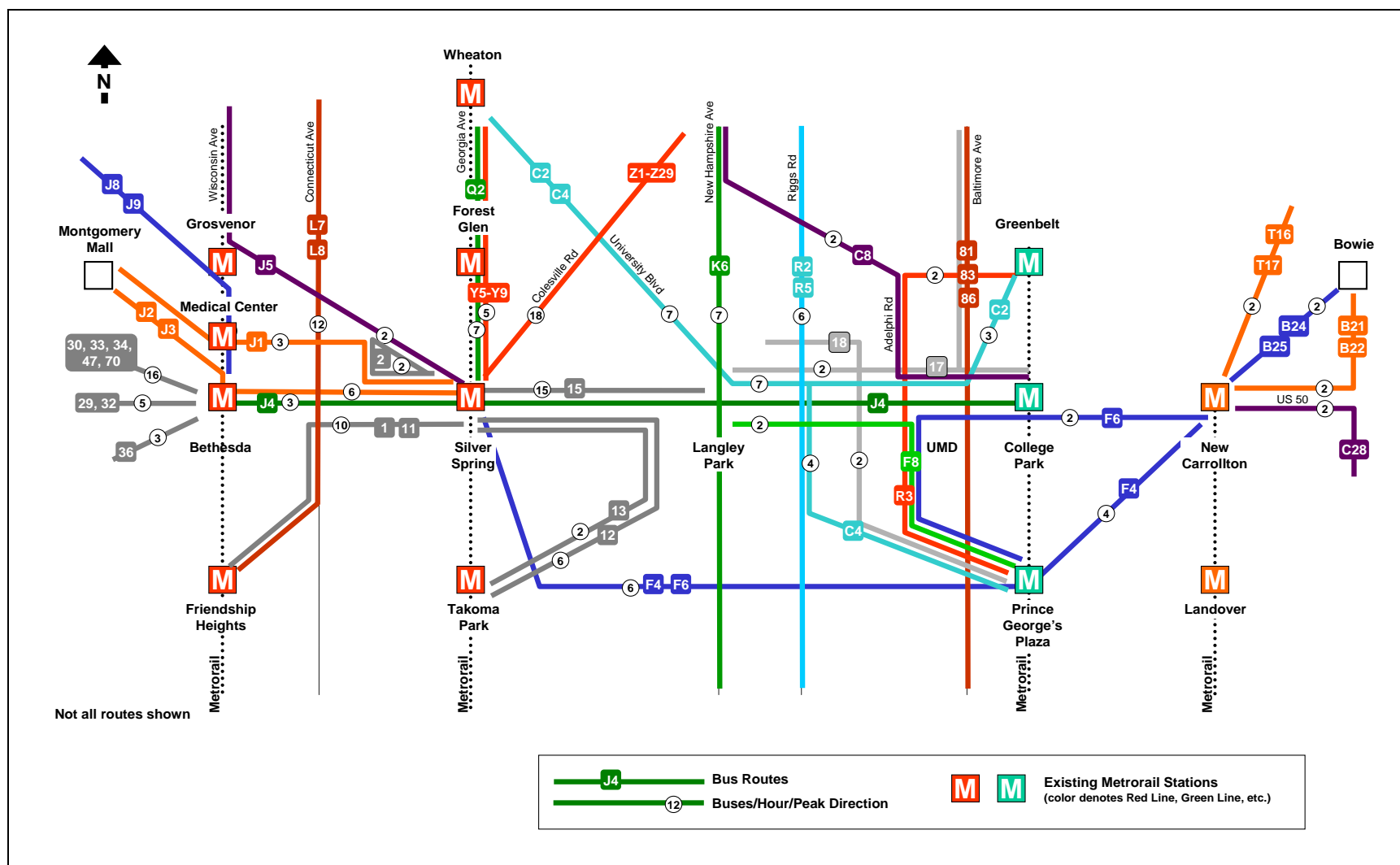
<sup>3</sup> [http://www.bethesda.med.navy.mil/Professional/Public\\_Affairs/BRAC/index.aspx](http://www.bethesda.med.navy.mil/Professional/Public_Affairs/BRAC/index.aspx), National Naval Medical Center BRAC Facts and FAQs, retrieved 10/17/07.



**Table 2-1: Headways for Existing East-West Bus Service within the Corridor (minutes)**

Route	Terminal and Intermediate Points	Early Morning	AM Peak	Midday	PM Peak	Evening	Saturday	Sunday	Average Daily Riders
WMATA J1	Montgomery Mall-Medical Center – Silver Spring Metro	--	20	--	20	---	--	--	<b>6,600</b>
WMATA J2	Montgomery Mall – Bethesda – Silver Spring Metro	20	17	20	24	15	20	25	
WMATA J3	Montgomery Mall – Bethesda – Silver Spring Metro	--	17	--	24	--	--	--	
WMATA J4	Bethesda Metro – Silver Spring – College Park Metro	--	20	--	20	--	--	--	<b>1,000</b>
WMATA C2	Wheaton Metro – Greenbelt Metro	--	22	30	16	--	30	--	<b>5,200</b>
WMATA C4	Twinbrook Metro – Prince George’s Plaza Metro	10	22	30	16	30	30	16	<b>7,800</b>
WMATA F4	Silver Spring – New Carrollton	12	12	40	15	--	30	60	<b>4,600</b>
WMATA F6	Silver Spring – New Carrollton	--	20	40	30	--	--	--	<b>3,100</b>
Ride On 15	Silver Spring Metro – Langley Park	15	4	12	4	30	12	15	<b>7,200</b>
TheBus 17	Langley Park – UM-College Park Metro	45	45	45	45	--	--	--	<b>40</b>
UM Shuttle 111	UM – Silver Spring Metro	--	35	75	45	30	--	--	<b>500</b>
UM Shuttle 104	UM – College Park Metro	8	8	12	8	20	20	20	<b>2,500</b>

Figure 2-1: Existing Transit Service





Metrobus schedules vary by route, with most routes running every day. Ride On schedules also vary by route, with most routes running daily. TheBus buses operate Monday through Friday, with no service on weekends or holidays. Bus headways on all three systems vary by time of day. Transit service to the National Naval Medical Center/National Institutes of Health area is provided from Silver Spring and points east via the J1 route, while the Metrorail Red Line Medical Center Station connects to the entire rail-bus network.

The No Build Alternative would not include any alterations to the existing Metrobus, Ride On, or TheBus systems. It would not include addition of a new mode or new exclusive right-of-way, and would therefore not significantly increase the reliability of the existing transit system. It is expected that increasing roadway congestion will decrease the reliability of the bus service, its adherence to its operational schedule, and the predictability of expected headways and transit travel times.

The fares of the existing transit services in the corridor are described in the following sections.

### **Metrorail Fares**

Regular Metrorail fares ranging from \$1.65 to \$4.50 are in effect on weekdays from opening to 9:30 AM, 3:00–7:00 PM, and 2:00 AM to closing. Reduced fares ranging from \$1.35 to \$2.35 are in effect at all other times. These fares are based on distance traveled. Metrorail senior-disabled fares are in effect at all times and are one-half of the regular fare. SmarTrip cards and other multi-trip passes may be purchased at Metrorail stations, Metro sales offices, retail outlets, or Commuter Stores.

### **Metrobus Fares**

The Metrobus fares are summarized in Table 2-2.

**Table 2-2: Metrobus Fares (2007)**

Regular Fare - Cash	\$1.35
Regular Fare – SmarTrip	\$1.25
Express Bus Fare	\$3.10
Transfers	Free
Metrorail-to-Metro bus transfers	Free

### **TheBus Fares**

TheBus uses a single, flat fare for all trips on its services. Adult fares are as shown in Table 2-3.

**Table 2-3: TheBus Fares (2007)**

Regular Fare	\$0.75
Metrobus and Ride On-to-Transfer	Free
Metrorail-to-TheBus transfer	\$0.25
TheBus-to-Metrobus and Ride On Transfer	\$0.50

## **Ride On Fares**

Ride On uses a single, flat fare for all trips. Fares for these services are shown in Table 2-4. SmarTrip cards may be used on Ride On.

**Table 2-4: Ride On Fares (2007)**

Regular Fare or Token	\$1.25
Local Bus Transfer (Valid for 2 hours, any direction)	Free
Metrorail-to-Ride On Bus Transfer	\$.35

Ride On accepts Metrobus and other local bus transfers at any stop on any route until its expiration time. Metrobus accepts Ride On and other local bus transfers at any stop in their system.

## **2.2. General Operating Characteristics of TSM and Build Alternatives**

The alternatives were developed to test the effectiveness of various alignment options, such as tunnel vs. surface segments. Operational characteristics are for this reason kept as similar as possible for TSM and each of the six Build Alternatives. These include:

- Fare structure
- Hours of service
- Frequency of trunkline service during both peak hours and off-peak hours
- Feeder bus network routes and frequencies
- Station locations and amenities

In certain circumstances, these characteristics do differ between alternatives, depending on the features of the mode or alignment. For example, some stations are not present in one or more alternatives because the alignment is in tunnel and stations in these areas infeasible or the alignment is not in that location. These station locations are:

- NIH/Medical Center – (Low Investment BRT only)
- Fenton Street (not included in High Investment BRT and LRT)

Several station locations vary slightly depending on the Alternative. These station locations are:

- Connecticut Avenue
- Fenton Street
- Arliss Street



### **2.2.1. Vehicles**

Bus service in the No Build would be provided by a range of vehicle types as it is today. Bus service in the TSM would be provided by standard, 40-foot buses. Under the BRT alternatives the vehicles used would be articulated 60-foot buses. These buses would provide a higher capacity than the standard buses (90 passengers/bus vs. 60 for regular buses), and should enhance the quality of the ride as well – providing faster exiting, more comfortable seating, and a smoother ride.

MTA's current policy for all new bus purchases calls for a diesel hybrid fuel system.

In the LRT alternatives, peak period trains are assumed to comprise two-car trains powered by overhead wires. For planning purposes, passenger capacity is 150 per car, for a total of 300 per train.

### **2.2.2. Service Concept**

The diverse land uses and economic base in the Purple Line corridor include residential, commercial, industrial, institutional, and governmental sectors. This generates a wide variety of trip types and purposes that reflect the equally wide range of demographics of the region.

Currently, there is bus service throughout the study corridor, with several of the highest ridership bus routes in the region. The Purple Line alternatives would enhance and expand the existing service by providing a higher speed, higher capacity trunkline transitway.

Purple Line service planning includes not only 2030 plans for the corridor alternatives but also plans for the background local bus network operated in the region. Service plans discussed in detail below for the Transportation System Management (TSM) Alternative and each of the six Build Alternatives endeavor to create a route network as interconnected as possible. Redundant and overlapping service has been proposed for elimination, while other routes have been restructured to provide increased connectivity with the corridor service to provide more convenient, user-friendly service for passengers.

All of the Build Alternatives serve the same markets because the alignments and station locations are quite similar. All alternatives serve downtown Bethesda directly with the trunkline service; however, only the Low Investment BRT Alternative and the two Medium BRT variations (described in *Section 2.3, Alternative 4 – Medium Investment BRT.*) directly serve the National Institutes of Health and the National Naval Medical Center area. All others, including the No Build and TSM Alternatives, serve this market with improved bus service, connecting Silver Spring as well as Metrorail service to Bethesda.

Minor variations may occur in station locations due to actual alignment. For example, the Connecticut Avenue Station could have one of three locations depending on the alternative: at Jones Bridge Road for the Low Investment BRT Alternatives; at the Georgetown Branch right-of-way alignment for the Low Investment LRT, and Medium and High Investment BRT and LRT Alternatives; and at East West Highway for the TSM Alternative. The actual locations of the stations would be determined in later design and engineering phases of the project. The





principal difference among alternatives is in their use of shared and dedicated lanes and at grade, tunnel, and elevated running ways.

Table 2-5 provides the station locations, the markets served, and the connecting transit service at each station.

**Table 2-5: Proposed Stations, Markets, and Connecting Transit Services**

<b>Stations/Stops</b>	<b>Location</b>	<b>Markets Served</b>	<b>Connecting Transit Services</b>
Bethesda Metro Station		Central business and residential district, and transfers	Metrorail Red Line; Metrobus: J2, J3, J7, J9; Ride On: 29, 30, 32, 33, 34, 36, 42, 47, 70, 92
NIH/Medical Center (Low Investment BRT only)	Wisconsin Avenue and Jones Bridge Road	NIH, NNMCC, and residential and transfers	Metrorail Red Line; Metrobus: J2, J3, J7, J9; Ride On: 30, 33, 42, 46, 70,
Connecticut Avenue (Low Investment BRT only)	Jones Bridge Road	Residential	Metrobus: L7, L8
Connecticut Avenue (all alternatives except Low Investment BRT)	Georgetown Branch ROW	Local business and residential	Metrobus: L7, L8
Lyttonsville Place	Georgetown Branch ROW	Local business and residential	Ride On: 2,
16 <sup>th</sup> Street and CSX ROW	CSX ROW	Local business and residential, and transfers	Metrobus: J5, Q2, Y5, Y7, Y8, Y9; Ride On: 3, 4, 5, 127
Silver Spring Transit Center	Colesville Road and Wayne Avenue	Central business and residential district, entertainment, and transfers	Metrorail Red Line; MARC Brunswick Line; UM Shuttle 111; Metrobus: F4, F6, J1, J2, J3, J5, Q2, S2, S4, Y5, Y7, Y8, Y9, Z2, Z6, Z8, Z9, Z11, Z13, Z29, 70, 71, 79; Ride On: 1, 2, 3, 4, 5, 8, 9, 11, 12, 13, 14, 16, 17, 18, 19, 20, 22, 28, 127
Fenton Street and Wayne Avenue (all alternatives except High Investment BRT and LRT)	Wayne Avenue	Central business and residential district, and transfers	Metrobus: F4, F6; UM Shuttle 111; Ride On: 12, 16, 17, 19, 20, 28
Dale Drive	Wayne Avenue	Local residential	Ride On: 3, 12, 19; UM Shuttle 111
Manchester Road	Wayne Avenue	Local residential	Ride On: 12, 13, 19
Thayer Avenue	West of Nolte Avenue		Ride On: 20
Arliss Street	Piney Branch Road	Local business and residential	Ride On: 14, 16, 20, 24
Gilbert Street	University Boulevard	Local business, and residential, and transfers	Metrobus: C2, C4



**Table 2-5: Proposed Stations, Markets, and Connecting Transit Services**

Stations/Stops	Location	Markets Served	Connecting Transit Services
Takoma/Langley Transit Center (University Boulevard and New Hampshire Avenue)	University Boulevard and New Hampshire Avenue	Local business and residential, and transfers	Metrobus: C2, C4, F8, K6; UM Shuttle 111; Ride On: 16, 17, 18; TheBus: 17, 18
Riggs Road	University Boulevard	Local business and residential,	Metrobus: C2, C4, F8, R5, R1, R2; TheBus: 17, 18
Adelphi Road and Campus Drive	Campus Drive at UMUC	Residential, UMUC, and transfers	Metrobus: C2, C8, F6, F8, R3; TheBus: 17
UM Campus Center		UM	Metrobus: C2, C8, F6; UM Shuttles; TheBus: 17,
UM East Campus	US 1	Commercial, hotel, residential, UM, and transfers	Metrobus: C2, C8, F6, 81, 83, 86; TheBus: 17
College Park Metro Station		M Square Research Park, residential, future mixed-use development, and transfers	Metrorail Green Line; MARC Camden Line; Metrobus: C2, C8, F6, R12, 83, 86; TheBus: 14, 17 CAR: G, H
River Road		M Square research park and residential	Metrobus: F6, R12; TheBus: 14
Riverdale Park	Kenilworth Avenue and MD 410	Local business and residential and transfers	Metrobus: F4, R12, 84, 85; TheBus: 14
Riverdale Road	Veterans Parkway	Local business and residential	Metrobus: F4, 84, 85; TheBus: 14
Annapolis Road	Veterans Parkway	Local business	Metrobus: F13, T18,
New Carrollton Metro Station		Business and residential, including IRS, CSC; future mixed-use development, and transfers	Metrorail Orange Line, MARC Penn Line, Amtrak; Metrobus: B21, B22, B24, B25, B27, B29, B31, C28, F4, F6, F12, F13, F14, R12, T16, T17, T18, 84,85, 88; TheBus: 15, 16, 21, 21X

**Notes:**

- A) Bus operators – Metrobus = WMATA, Ride On = Montgomery County, TheBus = Prince George’s County, CAR = Connect a Ride
- B) Metrobus J1 discontinued under Low Investment BRT Alternative
- C) Metrobus J4 and Ride On 15 replaced by all Purple Line alternatives

No new parking facilities would be constructed as part of the Purple Line. Municipal parking garages exist near the Bethesda and Silver Spring Metro Stations, and transit parking facilities exist at the College Park and New Carrollton Metro Stations.

Additional kiss-and-ride facilities would be considered at the following stations: Connecticut Avenue at the Georgetown Branch right-of-way and Lyttonsville. Silver Spring Transit Center, College Park, and New Carrollton already have kiss-and-ride parking facilities available and the Purple Line would not add more.

### 2.2.3. Service Characteristics

For the purpose of the alternatives analysis, which is to identify the differences among different levels of investment, a number of the service-related characteristics have been held constant across all the alternatives. These characteristics include the following:

- Hours of service
- Headways
- Fares

#### Hours of Service

Purple Line services would operate at approximately the same hours as Metrorail including extended hours on weekend nights (Table 2-6). Service would begin at terminal stations at 5:00 AM weekdays and 7:00 AM on Saturday and Sunday and would operate through midnight Sunday through Thursday and until 3:00 AM on Friday and Saturday. All times are approximate and might vary slightly. Because service start time would be scheduled for terminal stations, first trains would leave many stations later than system opening times and last trains would leave earlier than closing times.

**Table 2-6: Span of Service for Build Alternatives**

Day of Week	Hours
Monday – Thursday	5:00 AM – 12:00 AM
Friday	5:00 AM – 3:00 AM
Saturday	7:00 AM – 3:00 AM
Sunday	7:00 AM – 12:00 AM

#### Headways

The headways for the TSM and all Build Alternatives would be 6 minutes each direction during peak hours and 10 minutes off-peak (see Table 2-7).

**Table 2-7: Build Alternatives Headways**

Day of Week	Early AM	Peak	Midday	PM Peak	Evening	Late PM
Weekdays	10 min.	6 min.	10 min.	6 min.	10 min.	10 min.
Saturdays	20 min.	N/A	10 min.	N/A	10 min.	20 min.
Sundays	20 min.	N/A	10 min.	N/A	10 min.	20 min.

#### Fares

Described below are the fares of Metrobus, followed by the proposed fares for the Purple Line.



### Metrobus Fares

The Metrobus fares are summarized in Table 2-8.

**Table 2-8: Metrobus Fares (2007)**

Regular Fare - Cash	\$1.35
Regular Fare - SmarTrip	\$1.25
Express Bus Fare	\$3.10
Transfers	Free
Metrorail-to-Metro bus transfers	Free

### TSM Fare Assumptions

TSM route fare is assumed to be a flat fare following the regular Metrobus fares. Cash fares and multi-trip passes will be accepted by operators upon boarding the vehicle. All fare instruments would be made available at Metrorail stations. SmarTrip cards and other multi-trip passes would also be purchased at Metro sales offices, retail outlets, or Commuter Stores.

### LRT and BRT Fare Assumptions

It is assumed that LRT and BRT fares would be a flat fare following the regular Metrobus fares described above. To expedite boarding and alighting, a proof-of-purchase payment method is assumed with tickets purchased from ticket vending machines at stations. Passengers would board through multiple doors to speed loading. Roving, on-board fare inspectors would be required to reduce the incidence of fare evasion, as is typical of most proof-of-purchase operations in the United States. SmarTrip cards and other multi-trip passes would also be purchased at Metro sales offices, retail outlets, or Commuter Stores.

Fare assumptions for the Purple Line, as described above, would initially replicate existing Metrobus fare structure and policies. Purple Line transfers to Metrobus and Metrorail would initially be free. Transfers to other local services will be equal to existing bus-to-bus transfer policies. Fare structure and policy will be re-examined as the Purple Line advances toward implementation when the operator of the Purple Line is determined and agreements among local transit service providers have been reached.

#### **2.2.4. Feeder Bus Service**

An extensive and comprehensive bus network is currently in place in the Purple Line corridor, operated by WMATA and the two counties, Montgomery in the west and Prince George's in the east. While many of these routes have a role in serving purely local travel markets, a very large number of them feed the Metro stations at Bethesda, Silver Spring, College Park, and New Carrollton. Thus they are a ready-made feeder bus network for the Purple Line, which would serve those Metro stations. The number of routes performing this feeder function is considerable, 14 routes at Bethesda, 28 routes at Silver Spring, 10 routes at College Park, and 24 routes at New Carrollton. In addition, nine bus routes plus the UM shuttle presently serve the area of the University Boulevard/New Hampshire Avenue intersection. This intersection is the site of the future Takoma/Langley Transit Center, a planned and programmed facility that will



serve existing bus routes, as well as the Purple Line, and will provide enhanced amenities to transit patrons. Construction of the transit center is expected to be completed in 2009.

If the Purple Line were built, some feeder bus route revisions would be made to better serve the Purple Line stations. Given the extensive existing bus network, these changes would be relatively minor in scope. Because all six Build Alternatives serve the same markets and have stations that are, for the most part, in the same locations, feeder bus service would be the same for all Build Alternatives.

The span of services of the bus routes that feed the TSM and Build Alternatives would be adjusted to service the market needing extended service times.

### ***2.2.5. Operating Characteristics***

The end-to-end travel times, average estimated speeds, and fleet size for the TSM Alternative and each Build Alternative are shown in Table 2-9. As expected, the High Investment LRT Alternative, with strategic grade separation and mostly dedicated or exclusive right-of-way, would have the shortest running time and the highest average speed of all the alternatives.

**Table 2-9: Operating Characteristics of Alternatives**

<b>Alternative</b>	<b>End-to-End Travel Time, Peak (minutes)</b>	<b>End-to-End Average Speed (mph)</b>	<b>Peak Vehicle Requirement (includes spares)</b>
TSM	108	9	68
Low Investment BRT	96	10	60
Medium Investment BRT	73	13	49
High Investment BRT	59	16	42
Low Investment LRT	62	15	44
Medium Investment LRT	59	16	44
High Investment LRT	50	19	44

Average station-to-station travel time estimates for the Build Alternatives are shown in **Table 2-10**.

The Medium Investment BRT variation via the Jones Bridge Road would have an end-to-end running time of 76 minutes, which would result in an average speed of 13 mph. The other variation, Medium Investment BRT Extended to Medical Center, would have an end-to-end running time of 78 minutes, which would also result in an average speed of 13 mph, although the time to downtown Bethesda, the larger travel market than Medical Center, would be 59 minutes compared to the 76 minutes via the Jones Bridge Road alignment.



**Table 2-10: Average Station-to-Station Travel Times (minutes)**

Segment Name	TSM	Low Invest. BRT	Med Invest. BRT	High Invest. BRT	Low Invest. LRT	Med Invest. LRT	High Invest. LRT
Bethesda Metro, North entrance to Medical Center Metro	NA	4.7	NA	NA	NA	NA	NA
Bethesda Metro, North entrance to Bethesda Metro, South entrance	NA	NA	5.2	5.2	NA	NA	NA
Medical Center Metro to Connecticut Avenue	NA	6.0	NA	NA	NA	NA	NA
Bethesda Metro, South entrance to Connecticut Avenue	10.8	NA	5.5	5.5	4.0	2.4	2.4
Connecticut Avenue to Grubb Road	7.3	NA	NA	NA	NA	NA	NA
Connecticut Avenue to Lyttonsville	NA	5.2	3.1	3.1	2.3	2.3	2.3
Grubb Road to Silver Spring Transit Center	13.2	NA	NA	NA	NA	NA	NA
Lyttonsville to Woodside/16 <sup>th</sup> Street	NA	2.4	2.4	2.4	2.1	2.1	2.1
Woodside/16 <sup>th</sup> Street to Silver Spring Transit Center	NA	6.2	2.1	2.1	2.8	2.0	2.0
Silver Spring Transit Center to Fenton Street	5.1	4.6	3.1	N/A	3.1	3.1	N/A
Silver Spring Transit Center to Dale Drive	NA	N/A	N/A	2.6	N/A	N/A	3.6
Fenton Street to Dale Drive	4.8	2.8	3.0	N/A	3.8	3.1	N/A
Dale Drive to Manchester Place	2.9	2.3	2.3	2.1	3.1	2.8	2.4
Manchester Place to Arliss Street	4.9	4.8	4.7	1.4	1.4	1.4	1.4
Arliss Street to Gilbert Street	6.6	6.6	3.4	4.0	3.8	3.8	3.8
Gilbert Street to Takoma/Langley Transit Center	4.8	4.8	2.3	2.2	2.2	2.2	2.1
Takoma/Langley Transit Center to Riggs Road	5.8	5.6	2.7	1.7	2.4	2.4	1.7
Riggs Road to Adelphi Road	6.0	5.7	5.6	3.1	3.3	3.3	3.1
Adelphi Road to UM Campus Center	4.0	3.7	2.9	2.6	2.9	2.9	2.6
UM Campus Center to UM East Campus	8.6	8.6	3.0	2.9	3.0	3.0	2.9
UM East Campus to College Park Metro	2.0	2.2	3.0	3.0	3.0	3.0	3.0
College Park Metro to River Road	2.0	1.8	1.9	1.9	1.9	1.9	1.9

**Table 2-10: Average Station-to-Station Travel Times (minutes)**

Segment Name	TSM	Low Invest. BRT	Med Invest. BRT	High Invest. BRT	Low Invest. LRT	Med Invest. LRT	High Invest. LRT
River Road to Riverdale Park	5.5	5.4	4.3	3.2	4.6	4.6	3.1
Riverdale Park to Riverdale Heights	4.4	4.0	4.7	2.9	4.8	4.8	2.9
Riverdale Heights to Annapolis Road	4.7	4.0	3.6	3.5	3.5	3.5	3.3
Annapolis Road to New Carrollton Metro	4.6	4.4	3.8	3.5	3.9	3.9	3.6
<b>Total Running Time (rounded up to the nearest minute)</b>	<b>108</b>	<b>96</b>	<b>73</b>	<b>59</b>	<b>62</b>	<b>59</b>	<b>50</b>

**Table 2-11: Comparison of Running Way Characteristics by Alternative**

Type Of Running Way	No Build	TSM	Low Invest. BRT	Med Invest. BRT	High Invest. BRT	Low Invest. LRT	Med Invest. LRT	High Invest. LRT
Horizontal Alignment Type (Miles)								
Dedicated	All shared	All shared	0.67	7.4	7.71	8.62	9.18	8.88
Exclusive			1.97	4.85	9.37	5.73	5.74	8.81
Shared (with traffic)			14.43	4.68	0.15	1.76	1.33	0.16
Vertical Alignment Type (Miles):								
Aerial	All surface	All surface		1.26	1.63	1.06	1.06	1.73
Surface			17.07	15.66	12.99	14.39	14.5	12.9
Tunnel				0.01	2.61	0.66	0.69	3.22
End-to-end peak period running times Bethesda to New Carrollton (minutes)	--	108	96	73	60	62	59	50





### Reliability

The overall reliability of any of the Build Alternatives would be higher than that for the No Build or TSM Alternatives because, for the most part the service, depending on the alternative, would operate in dedicated lanes or exclusive right-of-way, thus removing the service from the potential delays of roadway congestion. In areas where the Purple Line would operate in mixed-use lanes, it is anticipated that queue jumpers and signal prioritization would be implemented where possible. The High Investment Alternatives would have the highest reliability, and the Low Investment Alternatives would have the lowest reliability. Because of the terminal configuration of the High and Medium Investment BRT Alternatives at Bethesda that involve a street-running loop, those two alternatives would not be as reliable as their LRT counterparts. Similarly, the Low Investment BRT Alternative with its operations along Jones Bridge Road between Bethesda and Silver Spring would have lower reliability than the Low Investment LRT Alternative, which would operate in the Georgetown Branch right-of-way, which is an exclusive right-of-way. See Table 2-11 for a comparison of the types of running way for each of the alternatives.

## **2.3. Alignments of Purple Line Alternatives**

### **2.3.1. *Alternative 2 – TSM Alternative***

As described by the FTA, transportation system management (TSM) alternatives are relatively low-cost approaches to addressing transportation problems in the corridor. The TSM Alternative represents the best that can be done for mobility without constructing a new transit guideway. Generally, the TSM Alternative emphasizes upgrades in transit service through operational and small physical improvements, plus selected roadway upgrades through intersection improvements, minor widenings, and other focused traffic engineering actions. A TSM Alternative normally includes such features as bus route restructuring, more frequent bus service, expanded use of articulated buses to reduce crowding for passengers, bus lanes, special bus ramps on freeways, expanded park-and-ride facilities, express and limited-stop service, signalization improvements, and improved transfer operations. While the scale of these improvements is generally modest, TSM Alternatives may cost tens of millions of dollars while the build alternatives range up to several hundreds of millions or billions of dollars.

TSM Alternatives are important components of transit studies because they provide a baseline against which all major investment alternatives are evaluated for the FTA's New Starts program. The most cost-effective TSM Alternative generally serves as the baseline against which the selected Build Alternative is compared during the New Starts rating and evaluation process. This process would begin when the MTA applies for permission to initiate preliminary engineering, and would continue through final design.

The TSM Alternative would include improved bus service in the corridor and a new through-route from Bethesda to New Carrollton replacing the existing J4 route and adding service on portions of the F4/F6 routes between College Park and New Carrollton. The TSM bus service would consist of a limited-stop bus route that would make stops consistent with those of the Build Alternatives. The core service improvements under the TSM Alternative include limited-stop bus service, queue jump lanes, selected signal preference strategies, and upgrades to bus stop amenities. Sixty-foot articulated buses would be used.

The TSM service would provide faster one-seat rides between major activity centers, including Medical Center Metro Station, Bethesda Metro Station, Silver Spring Metro Station, Takoma Park, Langley Park, University of Maryland, and the College Park Metro Station. This route would also serve transfers to bus routes operating on radial streets, including those on Wisconsin Avenue, Connecticut Avenue, Colesville Road, Georgia Avenue, New Hampshire Avenue, Riggs Road, US 1, and Annapolis Road. It would serve the long-haul trips now carried by WMATA J2/J3, Ride On 15, and, to a degree, WMATA C2/C4; and is estimated would serve nearly 80 percent of the passengers now boarding those existing routes along this corridor.

From Bethesda the TSM bus route would operate along East West Highway (Montgomery Avenue eastbound, between Woodmont Avenue and East West Highway) and Colesville Road to the Silver Spring Transit Center, and would then follow Wayne Avenue, Flower Avenue, and Piney Branch Road to University Boulevard. From there, the TSM route would operate along



University Boulevard until the University of Maryland campus, following Campus Drive through campus and continuing on Paint Branch Parkway to the College Park Metro Station. After serving the station, the TSM route would continue on River Road, Kenilworth Avenue, East West Highway, Riverdale Road, Veterans Parkway, and Harkins Road to the west side of the New Carrollton Metro Station. Eastbound the TSM route would follow Harkins Road to Annapolis Road back to Veterans Parkway and continue in the reverse order of the eastbound route described above.

A principal difference between the TSM and Build Alternatives is that the TSM service would operate on East West Highway between Bethesda and Silver Spring, rather than along a new guideway facility along the Georgetown Branch and Metropolitan Branch railroad rights-of-way between Bethesda and Silver Spring, as with the Build Alternatives (except under the Low Investment BRT Alternative, which runs along Jones Bridge Road.) Along East West Highway, stops would be located at Connecticut Avenue and at Grubb Road.

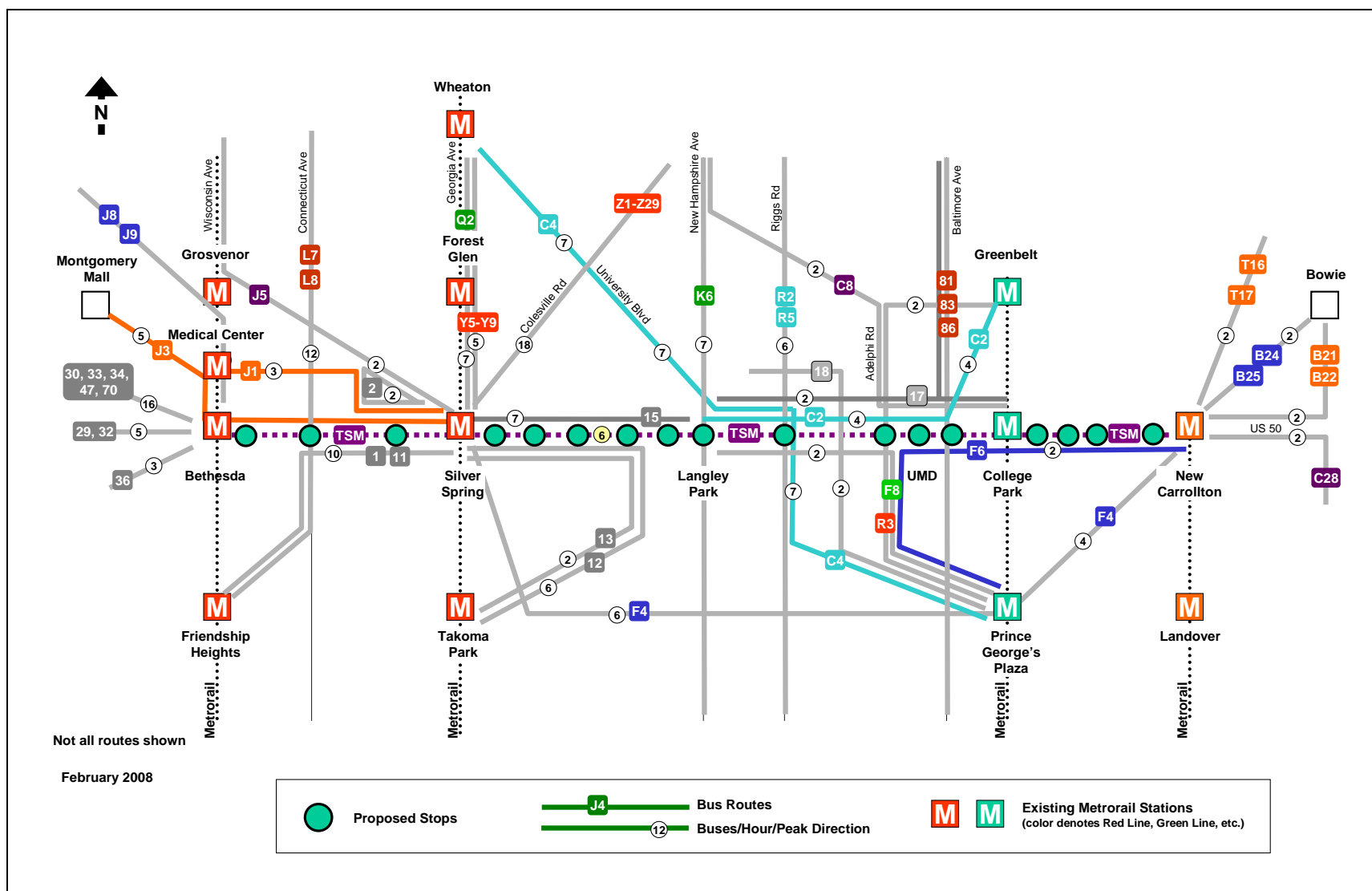
Transit service to the National Naval Medical Center/National Institutes of Health area would be provided from Silver Spring and points east through the enhanced J1 service with queue jump lanes and operational or service modifications. The Metrorail Red Line Medical Center Station would continue to provide connectivity to the entire rail-bus network.

As a limited-stop service, TSM bus stops would be located, west to east, at the Bethesda Metro Station, Connecticut Avenue, Grubb Road, Silver Spring Transit Center, Fenton Street, Dale Drive, Manchester Place, Arliss Street, Gilbert Street, Takoma/Langley Transit Center at New Hampshire Ave, Riggs Road, Adelphi Road, University of Maryland campus on Campus Drive, US 1, College Park Metro Station, River Road, Riverdale Park, Riverdale Road, Annapolis Road, and New Carrollton Metro Station. Each stop would be enhanced with upgraded amenities including new and enlarged shelters, concrete pads meeting ADA guidelines, bus and local information, and Next Bus information. The concept is to provide a branded, easily identifiable set of bus routes and bus stops for the enhanced service and to improve those selected bus stops to properly serve the passengers using the service. A map with proposed TSM stop locations is shown in Figure 2-2.

### **TSM Service Plan**

The TSM service is envisioned to be 6-minute peak and 10-minute off-peak throughout the corridor (Table 2-12). With five-minute headways and 15 percent vehicle spares, 68 vehicles would be required to operate the TSM service.

Figure 2-2: TSM Service





**Table 2-12: TSM Bus Headways**

Route	Terminal and Intermediate Points	Early Morning	AM Peak	Midday	PM Peak	Evening	Weekend
TSM	Bethesda – New Carrollton	10	6	10	6	10	10
J1	Medical Center – Silver Spring	-	20	-	20	-	-
J3	Eliminate; replace with Ride On 15 service	-	-	-	-	-	-
C2	Terminate at Langley Park Langley Park – Greenbelt	30	15	20	15	30	30
C4	Twinbrook Metro – Prince George’s Plaza Metro	10	8	15	8	20	20
F4	Silver Spring – New Carrollton	12	10	30	10		30
F6	Terminate at Prince George’s Plaza Prince George’s Plaza – New Carrollton	-	15	30	15	-	-
Ride On 15	Bethesda – Langley Park (extend to Bethesda)	15	15	15	15	30	15
TheBus 17	Langley Park–UM–College Park Metro	45	45	45	45	-	-
Shuttle – UM Silver Spring	UM – Silver Spring Metro	-	35	75	45	30	-

### Transit Travel Times

End-to-end, the TSM route is 16 miles long, requiring about 108 minutes of running time with an average round trip speed of 9 miles per hour. Today, the bus routes along the alignment, J4, F4, and F6, operate in very difficult circumstances with a wide range of times in each direction and between the AM and PM. Anecdotal reports from WMATA indicate that the J4 route may require 50 percent more time than scheduled on certain runs to complete its trip. These conditions complicate schedule preparation and operations planning. It is assumed TSM measures would somewhat mitigate these conditions; however, 2030 background traffic volumes and traffic congestion levels will be far greater than they are today. There is only limited opportunity for improving transit service travel times and reliability using signal preference strategies along the Purple Line Corridor. The major radial roadways that cross the corridor, such as Connecticut Avenue, Georgia Avenue, New Hampshire Avenue, Kenilworth Avenue, and US 1, are the major sources of delay at intersections. These roadways carry very heavy arterial traffic flows into and out of the District of Columbia and other major activity centers. There is very little opportunity to introduce signal preferences at these intersections without causing major exacerbation of traffic conditions. Queue jump lanes, however, do provide a travel time advantage enabling transit vehicles to get to the intersection and limit the delay to one or two traffic signal cycles.

Transit service to the Bethesda Naval Hospital/National Institutes of Health area would be provided from Silver Spring and points east through the enhanced J1 service with queue jump lanes and operational or service modifications. The Metrorail Red Line Bethesda Station would continue to provide connectivity to the entire rail-bus network.

### **2.3.2. Build Alternatives**

The following section describes various alignments at low, medium, and high levels of investment. Several design options (e.g., tunnel segments, aerial, and at grade alternative horizontal alignments) would serve the same market.

All alternatives would extend the full length between the Bethesda Metro Station in the western portion of the corridor and the New Carrollton Metro Station in the east, with variations in alignment location, type of running way (shared, dedicated, or exclusive), and amount of grade separation. The decision whether to construct dedicated lanes depends on the ability of the service to operate reasonably well without dedication, and on the cost, in dollars or impacts.

Each alternative is identified by the level of investment. A matrix summarizing the BRT build alternatives is presented in Table 2-13 and a matrix summarizing the LRT Build Alternatives is presented in Table 2-14.

While six end-to-end alternatives have been defined and evaluated for the project, the ultimately selected Locally Preferred Alternative could include a mixture of segments from alternatives at different levels of investment.

All alternatives would include incorporation of signal priority and/or queue jump lanes at major intersections where feasible, if the analysis demonstrates that such priority provides significant time savings or reliability.

All alignments that would use the Georgetown Branch right-of-way (except the Low Investment BRT) would include construction of a permanent trail facility alongside the transitway between Bethesda and the Silver Spring Transit Center. This trail would be built following Montgomery County standards for trail design; it would be a 10-foot-wide paved trail with 2-foot shoulders. Between Pearl Street and just west of Jones Mill Road the trail would be on the north side of the transitway; elsewhere it would be on the south side. Access to the trail would be provided at various points along the way, as would crossings over the transitway. The MTA has set a goal of maintaining a landscaped buffer of approximately 10 feet between the trail and the transitway and, wherever possible, that the trail would be built at a slightly higher elevation than the transitway. A barrier, either a fence or a wall, would separate the trail and transitway. All alignments, including the Low Investment BRT, include construction of the trail from Jones Mill Road to the Silver Spring Transit Center. The trail would cross the CSX right-of-way on a new pedestrian bridge east of the existing Talbot Avenue bridge. After crossing the CSX right-of-way the trail would continue on the north side to the Silver Spring Transit Center.

Several design options have been considered. These design options are described following the descriptions of the alternatives.



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**Table 2-13: Summary of TSM and BRT Build Alternatives**

	Bethesda / Chevy Chase			Silver Spring					
TSM Alternative	The TSM goes from the Bethesda Metro Station (north entrance)out to Woodmont Avenue to Montgomery Lane to East West Highway.		The TSM would operate in mixed traffic, with signal priority treatments implemented where possible to increase schedule adherence. Westbound buses could use existing right-turn lanes to bypass queuing at Jones Mill Road and 16 <sup>th</sup> Street.		At Colesville Road, the TSM would turn left and then right onto Wayne Avenue and right onto Ramsey Street to access the Silver Spring Transit Center. The TSM would operate in mixed traffic with signal priority, where possible.		The buses would exit the SSTC along Ramsey Street, and follow Wayne Avenue in shared lanes to Flower Street. Buses turn right onto Flower Street, operating in shared lanes until Piney Branch Road. Signal priority would be provided, where possible.		
BRT									
Alternative 3: Low Investment BRT	The transitway goes from the Bethesda Metro Station (north entrance) up Woodmont Avenue to Jones Bridge Road.	On Jones Bridge Road the buses are in shared lanes with queue jump lanes at key intersections.	At Jones Mill Road the transitway joins the Georgetown Branch right-of-way. A permanent trail will be constructed along the south side of the transitway. There will be two new bridges over Rock Creek, one for the transitway, one for the trail.		At the CSX corridor the transitway stays on the south side of the CSX corridor, while the trail crosses CSX on a new bridge near Talbot Street Bridge. The transitway crosses 16 <sup>th</sup> and Spring Streets at grade.	Transitway crosses CSX at Spring Street and continues on Second Avenue. Buses enter Silver Spring Transit Center from Ramsey Street.		The buses continue up Wayne Avenue in shared lanes, to Flower Avenue, then Arliss Street.	
Alternative 4: Medium Investment BRT	The transitway begins with a one-way counter clockwise loop on Pearl St, East West Highway, Old Georgetown Road, with a stop at the Bethesda Metro Station (north entrance) Edgemoor Lane, Woodmont Avenue on to Georgetown Branch right-of-way alignment. Under the Air Rights Building, there is a direct elevator connection to the Bethesda Metro Station (south entrance). The trail is on the north side of transitway from Pearl Street east.		The transitway follows the Georgetown Branch right-of-way. There will be two bridges over Connecticut Avenue, one for the transitway, and one for the trail, as well as two new bridges over Rock Creek. The transitway and trail go under Jones Mill Road. Just west of Jones Mill Road the trail crosses to the south side of the transitway.		At the CSX corridor the transitway stays on the south side of CSX corridor, while the trail crosses CSX on a new bridge near Talbot Street Bridge. The transitway crosses 16 <sup>th</sup> and Spring Streets at grade.	East of Falklands Apartments the transitway crosses over CSX tracks, to arrive at the Silver Spring Transit Center.		The buses leave the CSX right-of way on Bonifant Street at grade in dedicated lanes.	Wayne Avenue in shared lanes with added left turn lanes, to Flower Avenue, then Arliss Street.
Alternative 5: High Investment BRT	The transitway begins with a one-way counter clockwise loop on Pearl St, East West Highway, Old Georgetown Road, with a stop at the Bethesda Metro Station (north entrance) Edgemoor Lane, and Woodmont Avenue on to Georgetown Branch right-of-way. Under the Air Rights Building, there is a direct elevator connection to the Bethesda Metro Station (south entrance). The trail is on the north side of transitway from Pearl Street east.		The transitway follows the Georgetown Branch right-of-way. There will be two bridges over Connecticut Avenue, one for the transitway, and one for the trail, as well as two new bridges over Rock Creek. The transitway and trail go under Jones Mill Road. Just west of Jones Mill Road the trail crosses to the south side of the transitway.		At the CSX corridor the transitway stays on the south side of CSX corridor, while the trail crosses CSX on a new bridge near Talbot Street Bridge. The transitway crosses 16 <sup>th</sup> and Spring Streets below the grade of those streets.	East of Falklands Apartments the transitway crosses over CSX tracks, to arrive at the Silver Spring Transit Center.	Tunnel from Silver Spring Transit Center to Wayne Avenue at Cedar Street	Wayne Avenue at grade in dedicated lanes, with a tunnel under Plymouth to Arliss Street.	
					(Design option) Aerial crossing of CSX west of Falklands Apartments with an aerial structure along Metro Plaza.	(Design option) Silver Spring/ Thayer Avenue tunnel that emerges on Thayer Avenue behind East Silver Spring Elementary School.			
					(Design option) The transitway crosses to the north side of the CSX corridor in a tunnel and continues along the north side.				



**Table 2-13: Summary of TSM and BRT Build Alternatives (Continued)**

University Boulevard		UM / College Park		Riverdale Park			New Carrollton			
The TSM service turns left on Piney Branch Road and then right on University Boulevard, both in shared lanes. Signal priority would be provided, where possible. Eastbound and westbound buses could use the existing right-turn lanes / shoulder (where available) to bypass queuing.		The buses pass through the University of Maryland campus on Campus Drive and cross US 1 at Paint Branch Parkway. Signal priority would be provided where possible. Westbound buses could utilize the existing right-turn lane at Paint Branch Parkway and US 1 to bypass queuing.		The TSM service follows Paint Branch Parkway and River Road in shared lanes. The buses turn right on Kenilworth Avenue in shared lanes. The buses then turn left onto East West Highway into shared lanes. Buses could utilize existing right turn lanes at MD 410 / MD 295 ramp terminals to bypass queuing. Signal priority would be provided where possible.			TSM service continues onto Veterans Parkway in shared lanes. Westbound buses could use the existing right turn along Veterans Parkway at Riverdale Road to bypass queuing.	TSM service turns left on to Annapolis Road into shared lanes.	The TSM services reach the New Carrollton Station via Harkins Road in shared lanes to arrive at the New Carrollton Metro Station.	TSM Alternative
									BRT	
The transitway turns left on Piney Branch Road and then right on University Boulevard, both in shared lanes.		The buses pass through the University of Maryland campus on Campus Drive and cross US 1 at Paint Branch Parkway.		The transitway follows Paint Branch Parkway and River Road in shared lanes. The buses enter the College Park Metro Station at the bus loop continuing on River Road in shared lanes.	The buses turn right on Kenilworth Avenue, southbound buses in a dedicated lane, northbound in shared lanes.	The buses turn left at East West Highway into shared lanes.	They continue on Veterans Parkway in shared lanes.	Turning left on Annapolis Road, the buses are in a dedicated lane westbound, and shared lanes eastbound.	The buses turn on to Harkins Road in shared lanes to arrive at the New Carrollton Metro Station.	Alternative 3: Low Investment BRT
The transitway turns left on Piney Branch Road and continues in dedicated lanes.	The buses turn right on University Boulevard, in dedicated lanes. All intersections are crossed at grade	The buses pass through the University of Maryland campus in dedicated lanes on Campus Drive.	At Regents Drive (the "M") the buses travel at grade in a new exclusive transitway through the parking lots adjacent to the Armory. At East Campus, the alignment crosses US 1 at grade on Rossborough Lane.	The transitway follows Paint Branch Parkway in shared lanes and enters the College Park Metro Station at the bus loop continuing on River Road in shared lanes.	The buses turn right on Kenilworth Avenue, both directions in dedicated lanes on the west side on the roadway.	The buses turn left at East West Highway in dedicated lanes.	Veterans Parkway in shared lanes. The crossing of Annapolis Road is at grade.	The buses turn left on to Ellin Road into dedicated lanes to arrive at the New Carrollton Metro Station.		Alternative 4: Medium Investment BRT
		(Design Option) Campus Drive to Preinkert Drive where the alignment turns south east and continues on new alignment between LeFrak Hall and the South Campus Dining Hall. The alignment continues east on Chapel Drive then on a new alignment to Rossborough Lane where it crosses US 1 at grade.								
The transitway turns left on Piney Branch Road and continues in dedicated lanes.	The buses turn right on University Boulevard in dedicated lanes, with bridges over key intersections, and an underpass at Adelphi Road.	The buses go through the University of Maryland campus in a tunnel under Campus Drive, emerging just past the "M" at Regents Drive	At Regents Drive (the "M") the buses travel at grade in a new exclusive transitway through the parking lots adjacent to the Armory. At East Campus, the alignment crosses US 1 at grade on Rossborough Lane.	The transitway follows Paint Branch Parkway in dedicated lanes until the CSX underpass. It turns right at the College Park Metro parking garage passing through the new station development and along the south side of River Road, in dedicated lanes.	The buses enter a tunnel from River Road to East West Highway at Kenilworth Road.	The buses follow East West Highway at grade in dedicated lanes.	On Veterans Parkway the transitway is in dedicated lanes with an underpass at Annapolis Road.	The buses turn left on to Ellin Road into dedicated lanes to arrive at the New Carrollton Metro Station.		Alternative 5: High Investment BRT

**Table 2-14: Summary of LRT Build Alternatives**

	Bethesda / Chevy Chase		Silver Spring				University Boulevard	
LRT								
Alternative 6: Low Investment LRT	The alignment follows the Georgetown Branch right-of-way. The alignment starts under the Air Rights Building with a direct elevator connection to the Bethesda Metro Station (south entrance). The trail does not go under the Air Rights Building, but off the alignment through Elm Street Park. The trail is on north side of the transitway from Pearl Street east.	The transitway follows the Georgetown Branch right-of-way. The LRT and the trail cross Connecticut Avenue at grade. There would be two new bridges over Rock Creek, one for the transitway, and one for the trail. The transitway and trail go under Jones Mill Road. Just west of Jones Mill Road the trail crosses to the south side of the transitway.	At the CSX corridor the transitway stays on south side of CSX corridor, while the trail crosses CSX on a new bridge near Talbot Street Bridge. The transitway crosses 16th and Spring Streets at grade.	East of Falklands Apartments the transitway crosses over CSX tracks, to arrive at the Silver Spring Transit Center.	The LRT leaves the CSX right-of way on Bonifant Street at grade in dedicated lanes.	It travels on Wayne Avenue in shared lanes, entering a tunnel after Manchester Place and continuing under Plymouth to emerge on Arliss Street.	The transitway turns left on Piney Branch Road and continues in dedicated lanes.	The LRT turns right on University Boulevard, in dedicated lanes. All intersections are crossed at grade, except there is an underpass at Adelphi Road.
Alternative 7: Medium Investment LRT	The alignment follows the Georgetown Branch right-of-way. The alignment starts under the Air Rights Building with a direct elevator connection to the Bethesda Metro Station (south entrance). The trail does not go under the Air Rights Building, but off the alignment through Elm Street Park. The trail is on north side of the transitway from Pearl Street east.	The transitway follows the Georgetown Branch right-of-way. There will be two bridges over Connecticut Avenue, one for the transitway, and one for the trail, as well as two new bridges over Rock Creek. The transitway and trail go under Jones Mill Road. Just west of Jones Mill Road the trail crosses to the south side of the transitway.	At the CSX corridor the transitway stays on south side of CSX corridor, while the trail crosses CSX on a new bridge near Talbot Street Bridge. The transitway crosses 16th and Spring Streets below the grade of those streets.	East of Falklands Apartments the transitway crosses over CSX tracks, to arrive at the Silver Spring Transit Center.	The LRT leaves the CSX right-of way on Bonifant Street at grade in dedicated lanes.	Wayne Avenue in shared lanes with added left turn lanes, entering a tunnel after Manchester Place and continuing under Plymouth to emerge on Arliss Street.	The transitway turns left on Piney Branch Road and continues in dedicated lanes.	The LRT turns right on University Boulevard, in dedicated lanes. All intersections are crossed at grade except there is an underpass at Adelphi Road.
Alternative 8: High Investment LRT	This alignment starts under the Air Rights Building with a direct elevator connection to the Bethesda Metro Station (south entrance). Under the Air Rights Building the trail is in the tunnel, elevated above eastbound tracks. The trail is on the north side of the tracks between Pearl Street and just west of Jones Mill Road.	The transitway follows the Georgetown Branch right-of-way. There will be two bridges over Connecticut Avenue, one for the transitway, and one for the trail, as well as two new bridges over Rock Creek,. The transitway and trail go under Jones Mill Road. Just west of Jones Mill Road the trail crosses to the south side of the transitway.	At the CSX corridor the transitway stays on south side of CSX corridor, while the trail crosses CSX on a new bridge near Talbot Street Bridge. The transitway crosses 16th and Spring Streets below the grade of those streets.	East of Falklands Apartments the LRT crosses over CSX tracks, to arrive at the Silver Spring Transit Center.	Tunnel from SSTC to Wayne Avenue at Cedar Street	Wayne Avenue at grade in dedicated lanes, with a tunnel under Plymouth to Arliss Street.	The transitway turns left on Piney Branch Road and continues in dedicated lanes.	The trains turn right on University Boulevard in dedicated lanes, with bridges over key intersections, and an underpass at Adelphi Road.
				(Design option) Aerial crossing of CSX west of Falklands Apartments with an aerial structure along Metro Plaza.	(Design option) Silver Spring/ Thayer Avenue tunnel that emerges on Thayer Avenue behind East Silver Spring Elementary School, but with an aerial structure on a portion of Piney Branch Road.			
			(Design option) The transitway crosses to the north side of the CSX corridor in a tunnel and continues along the north side.					



Table 2-14: Summary of LRT Build Alternatives (Continued)

UM / College Park			Riverdale Park			New Carrollton			LRT
The trains pass through the University of Maryland campus in dedicated lanes on Campus Drive.	At Regents Drive (the "M") the LRT travels at grade in a new exclusive transitway through the parking lots adjacent to the Armory. At East Campus, the alignment crosses US 1 at grade on Rossborough Lane.	The LRT uses Paint Branch Parkway in shared lanes.	LRT turns right at the College Park Metro parking garage passing through the new station development and along the south side of River Road, in dedicated lanes.	The LRT turns right at Kenilworth Avenue into dedicated lanes (both directions).	The LRT follows East West Highway at grade in dedicated lanes with shared left turn lanes. Shared under BW Parkway.	On Veterans Parkway the transitway is in dedicated lanes.	Turning left on Annapolis Road, the LRT is in dedicated lanes on the south/east side of the roadway.	Turning right on Harkins Road, the LRT is in dedicated lanes on the south side of the roadway to arrive at the New Carrollton.	Alternative 6: Low Investment LRT
The trains pass through the University of Maryland campus in dedicated lanes on Campus Drive.	At Regents Drive (the "M") the LRT travels at grade in a new exclusive transitway through the parking lots adjacent to the Armory. At East Campus, the alignment crosses US 1 at grade on Rossborough Lane.	The LRT uses Paint Branch Parkway in shared lanes.	LRT turns right at the College Park Metro parking garage passing through the new station development and along the south side of River Road, in dedicated lanes.	The LRT turns right at Kenilworth Avenue into dedicated lanes (both directions).	The LRT follows East West Highway at grade in dedicated lanes with shared left turn lanes. Shared under BW Parkway	On Veterans Parkway in dedicated lanes. The crossing of Annapolis Road is at grade.	The LRT turns left on to Ellin Road into dedicated lanes on the southeast side of the roadway to arrive at the New Carrollton Metro Station.		Alternative 7: Medium Investment LRT
(Design Option) Campus Drive to Preinkert Drive where the LRT turns south east and continues on a new alignment between LeFrak Hall and South Campus Dining Hall. The LRT continues east on Chapel Drive then on a new alignment to Rossborough Lane and it crosses US 1 at grade.									
The trains go through the University of Maryland campus in a tunnel under Campus Drive, emerging just past the "M" at Regents Drive.	At Regents Drive (the "M") the LRT travels at grade in a new exclusive transitway through the parking lots adjacent to the Armory. At East Campus, the alignment crosses US 1 at grade on Rossborough Lane.	The LRT uses Paint Branch Parkway in dedicated lanes until the CSX/ Metro underpass at College Park.	LRT turns right at the College Park Metro parking garage passing through the new station development and along the south side of River Road, in dedicated lanes.	The transitway enters a tunnel from River Road to East West Highway at Kenilworth Road.	The LRT follows East West Highway at grade in dedicated lanes in the median.	On Veterans Parkway the transitway is in dedicated lanes with an underpass at Annapolis Road.	The LRT turns left on to Ellin Road into dedicated lanes on the southeast side of the roadway to arrive at the New Carrollton Metro Station.		Alternative 8: High Investment LRT

### **2.3.3. *Alternative 3 – Low Investment BRT***

The Low Investment BRT (Figure 2-3) would primarily use existing streets to avoid the cost of grade separation and extensive reconstruction of existing streets. It would incorporate signal, signage, and lane improvements in certain places. This alternative would operate mostly in mixed lanes with at grade crossings of all intersections and queue jump lanes at some intersections. Southbound along Kenilworth Avenue and westbound along Annapolis Road, Low Investment BRT would operate in dedicated lanes. This is the only alternative that would operate on Jones Bridge Road, directly serving the National Institutes of Health and the National Naval Medical Center near Wisconsin Avenue and Jones Bridge Road. It is also the only alternative that would use the bus portion of the new Silver Spring Transit Center. A detailed description of the alternative follows.

From the western terminus in Bethesda, Low Investment BRT would originate at the Bethesda Metro Station bus terminal. The alignment would operate on Woodmont Avenue within the existing curb. At the Bethesda Station, the buses would enter the station via Edgemoor Road and exit onto Old Georgetown Road.

At Wisconsin Avenue, just south of Jones Bridge Road, the transitway would remain on the west side of the road in exclusive lanes in front of NIH. This alternative would then use the existing traffic signal, which would be modified to include a new signal phase to serve BRT movements, at the intersection of Wisconsin Avenue and Jones Bridge Road to turn onto Jones Bridge Road. At that intersection, a queue jump lane would be provided for westbound BRT vehicles to bypass traffic waiting to turn onto Wisconsin Avenue. The Low Investment BRT Alternative would then continue east along Jones Bridge in mixed traffic, using the existing travel lanes. At the intersection of Connecticut Avenue and Jones Bridge Road, a queue jump lane would be provided for westbound BRT vehicles. Some widening would be required at North Chevy Chase Elementary School. The alternative would then continue east along Jones Bridge Road in mixed traffic in the existing travel lanes. The alignment would continue along Jones Bridge Road to Jones Mill Road where it would turn right (south) onto Jones Mill Road. An eastbound queue jump lane would be provided at the intersection with Jones Mill Road to allow BRT vehicles to turn right onto Jones Mill Road.

From Jones Mill Road the alignment would turn east onto the Georgetown Branch right-of-way, where a new exclusive roadway would be constructed, with an adjacent trail on the south side. It would continue on the Georgetown Branch right-of-way, crossing Rock Creek Park on a new bridge, replacing the existing pedestrian bridge. The trail would be on an adjacent bridge. A trail connection to the Rock Creek Trail would be provided east of the bridge. The alignment would continue on the Georgetown Branch right-of-way until the CSX corridor at approximately Kansas Avenue. This alternative includes the construction of a permanent hiker biker trail between Jones Mill Road and Silver Spring.





At this point the alignment would turn southeast to run parallel and immediately adjacent to the CSX tracks on a new exclusive right-of-way. The trail would parallel the transitway, crossing the transitway and the CSX right-of-way east of Talbot Avenue on a new structure and continuing on the north side of the CSX right-of-way. The transitway would continue on a new roadway between the CSX tracks and Rosemary Hills Elementary School, and continue past the school. The transitway would cross 16<sup>th</sup> Street at grade, where a station would be located. This crossing would be accomplished by the installation of new traffic signals on 16<sup>th</sup> Street to accommodate the crossing of the transit vehicles. The transitway would continue parallel to the CSX tracks to Spring Street, at which point the buses turn to cross over the CSX tracks on Spring Street. A new traffic signal would be installed at Spring Street. The alignment would continue on Spring Street to 2<sup>nd</sup> Avenue where it would turn east. Buses would operate in shared lanes on Spring Street and Second Avenue.

Low Investment BRT would cross Colesville Road at grade and continue up Wayne Avenue to Ramsey Street, where the buses would turn right to enter the Silver Spring Transit Center at the second level. The buses would leave the Silver Spring Transit Center and return to Wayne Avenue via Ramsey Street. Low Investment BRT would continue east on Wayne Avenue in shared lanes.

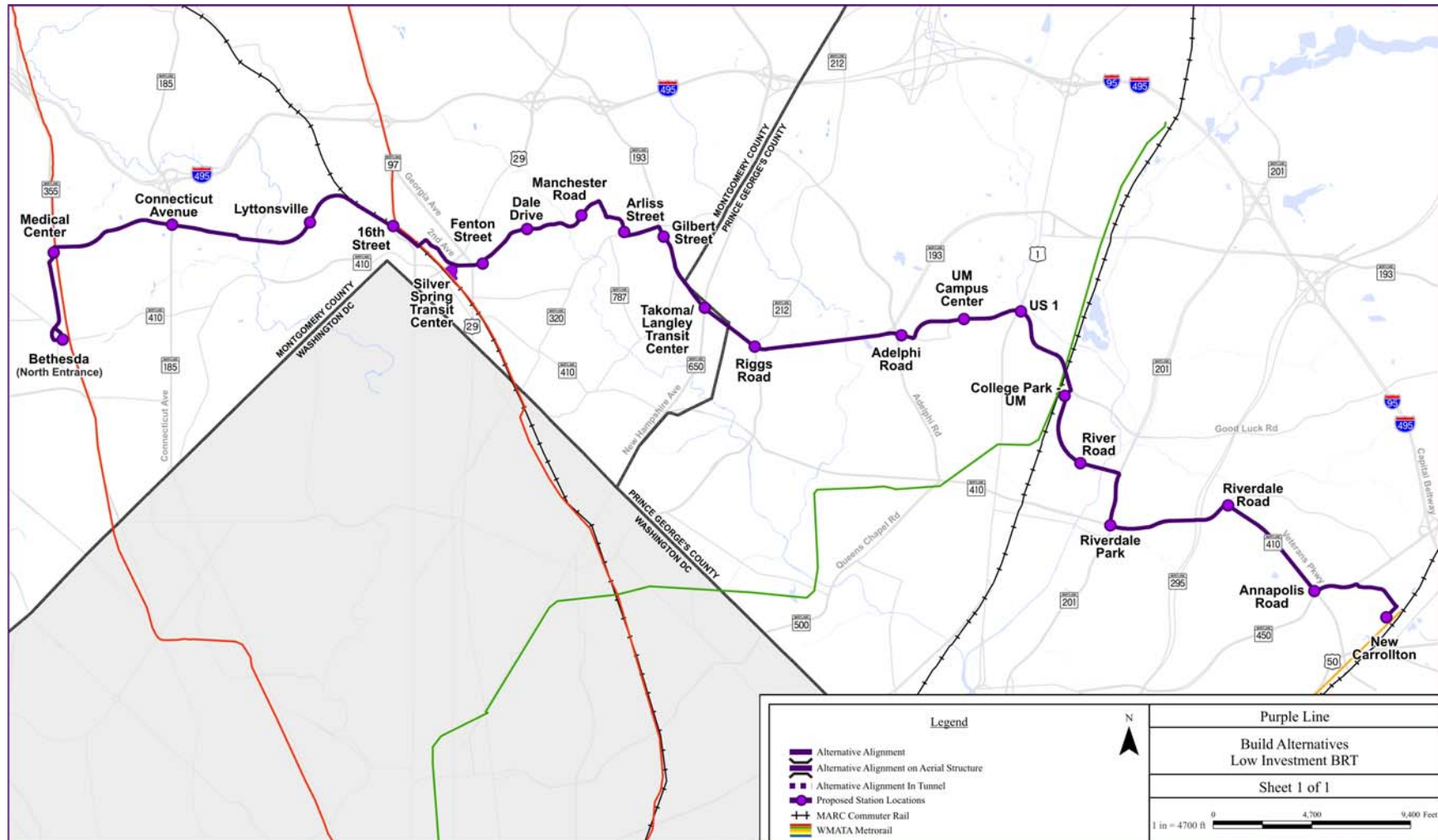
At Flower Avenue, the alignment would turn south to Arliss Street, where it would turn left onto Arliss Street, operating in shared lanes to Piney Branch Road. At Piney Branch Road the alignment would turn left to continue in shared lanes to University Boulevard. Low Investment BRT would follow University Boulevard to Adelphi Road. The lanes on University Boulevard would be shared.

At Adelphi Road the alignment would enter the University of Maryland campus on Campus Drive. The alignment would follow the Union Drive extension, as shown in the University of Maryland Facilities Master Plan (2001-2020), through what are currently parking lots. The alignment would follow Union Drive and then Campus Drive through campus in mixed traffic, and through the main gate at US 1, to Paint Branch Parkway.

Low Investment BRT would operate on Paint Branch Parkway to the College Park Metro Station in shared lanes. The transit vehicles would turn right onto River Road and access the existing bus loop at the station. The alignment would then follow River Road to Kenilworth Avenue in shared lanes.

The Low Investment BRT Alternative would then turn onto Kenilworth Avenue, which would be widened to provide one dedicated transit lane in the southbound direction. Northbound bus rapid transit vehicles would operate in mixed traffic within the existing northbound lanes on Kenilworth Avenue. This alternative would then turn left onto East West Highway, where it would operate in mixed traffic within the existing travel lanes. Continuing continues in shared lanes on Veterans Parkway. This alignment turns left on Annapolis Road. The westbound alignment on Annapolis would be dedicated, but the eastbound lanes would be shared. At Harkins Road the alignment travels in shared lanes to the New Carrollton Metro Station.

### Figure 2-3: Low Investment BRT







#### **2.3.4. *Alternative 4 – Medium Investment BRT***

Medium Investment BRT (Figure 2-4) is, by definition, an alternative that uses the various options that provide maximum benefit relative to cost. Most of the segments are selected from either the Low or High Investment BRT Alternatives.

This alternative follows a one-way counter-clockwise loop from the Georgetown Branch right-of-way onto Pearl Street, East West Highway, Old Georgetown Road, Edgemoor Lane, and Woodmont Avenue and from there onto the Georgetown Branch right-of-way under the Air Rights Building. The BRT stops twice at the Bethesda Metro station, once at the existing bus loop on Edgemoor Lane and again at the new southern entrance to the Metro Station under the Air Rights Building.

The alignment continues on the Georgetown Branch right-of-way with an aerial crossing over Connecticut Avenue and a crossing under Jones Mill Road.

This alignment, and all others that use the Georgetown Branch right-of-way, includes construction of a hiker-biker trail between Bethesda and the Silver Spring Transit Center.

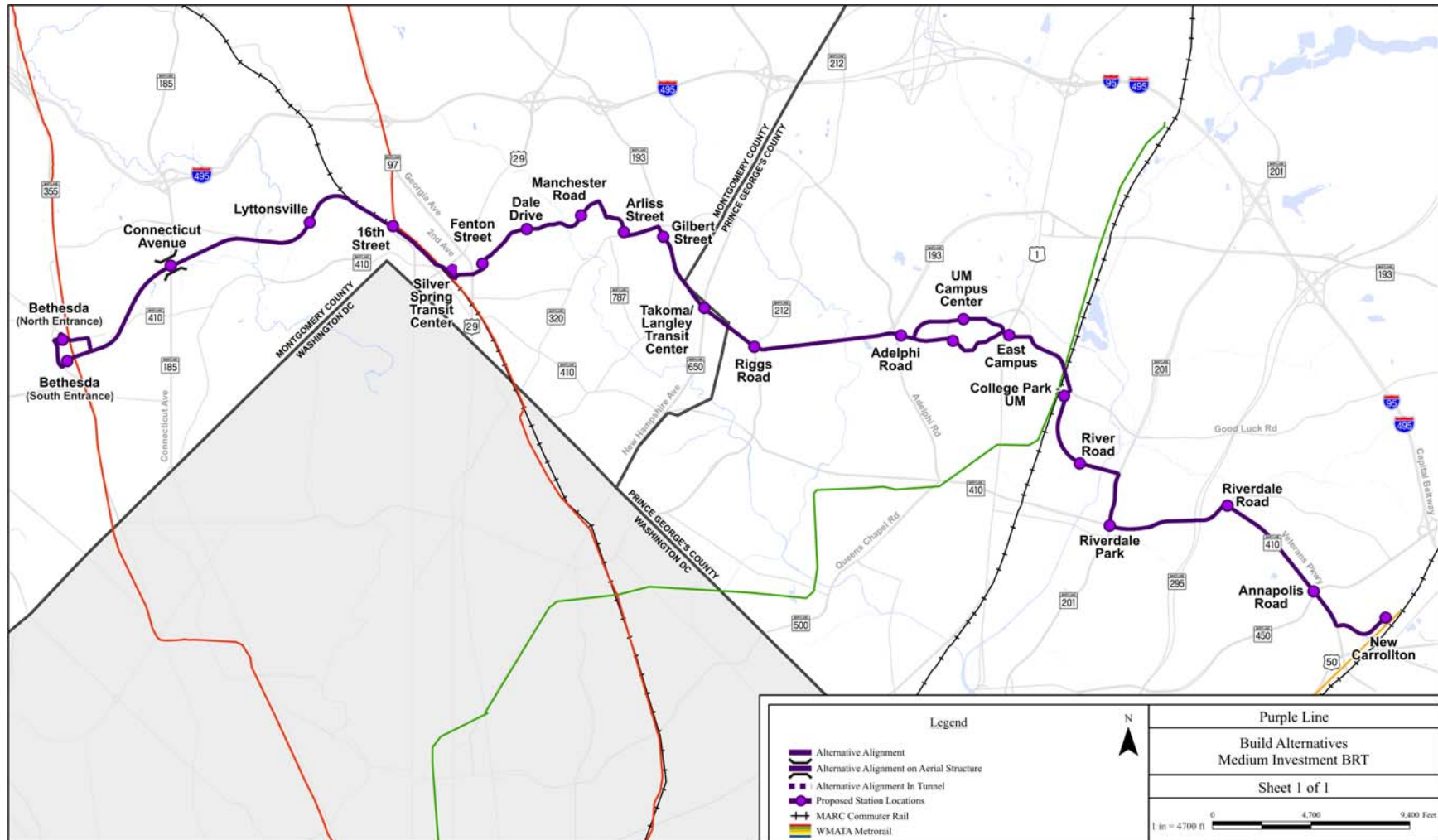
The alignment would continue on the Georgetown Branch right-of-way until the CSX right-of-way. The alignment would cross Rock Creek Park on a new bridge, replacing the existing pedestrian bridge. The trail would be an adjacent bridge. A trail connection to the Rock Creek Trail would be provided east of the bridge. The alignment would continue on the Georgetown Branch right-of-way until the CSX corridor at approximately Kansas Avenue. This segment of the alignment, from Jones Mill Road to the CSX corridor, would be the same for all the alternatives.

Like Low Investment BRT, this alternative would follow the CSX corridor on the south side of the right-of-way, but it would cross 16<sup>th</sup> Street and Spring Street at the grade of the streets, resulting in new signalized intersections.

After crossing Spring Street, the Medium Investment BRT would rise above the level of the existing development south of the CSX right-of-way. East of the Falklands Chase apartments, Medium Investment BRT would cross over the CSX tracks on an aerial structure to enter the Silver Spring Transit Center parallel to, but at a higher level than, the existing tracks.

The Medium Investment BRT Alternative would exit the Silver Spring Transit Center and turn onto Bonifant Street where it would operate at grade in dedicated transit lanes on the north side of Bonifant Street. Under this alternative, Bonifant Street, between Ramsey Street and Fenton Street, would be converted from two-way operation to one-way operation (either eastbound or westbound). On-street parking would remain along the south curb. The very low volume of westbound or eastbound traffic currently using Bonifant Street between Fenton Street and Georgia Avenue would be diverted to Thayer Avenue, one block to the south. Some minor widening of Bonifant Street is expected between Ramsey Street and Georgia Avenue, where these alternatives would cross at grade using the existing traffic signal. The slight modification would accommodate the conversion of Bonifant Street to one-way operation.

**Figure 2-4: Medium Investment BRT**





Just prior to Fenton Street the alignment would turn north toward Wayne Avenue. Approaching Fenton Street, these alternatives would turn left and tie into the existing signalized intersection of Fenton Street and Wayne Avenue as a new approach. The traffic signal would be modified to incorporate a new signal phase to accommodate transit movements. This alternative would then continue east, passing through Cedar Street on Wayne Avenue.

The alignment would continue on Wayne Avenue in shared lanes with added left turn lanes at the signalized intersections, to Flower Avenue and then Arliss Street. At Piney Branch Road the alternative would turn left into dedicated lanes and continue on to University Boulevard. Piney Branch Road would be widened to accommodate one new dedicated transit lane in each direction; this alternative would operate in the curb lanes, which would be shared with right-turning traffic along Piney Branch Road. The existing two-way left-turn lane between Arliss Street and Barron Street would be removed, and the unsignalized access points along this segment of Piney Branch Road would be converted to right-in /right-out access.

At University Boulevard, the Medium Investment BRT would turn right onto University Boulevard, which would be widened to accommodate one new dedicated transit lane in each direction. This alternative would operate in the curb lanes, which would also accommodate right-turn movements. Along University Boulevard, for automobile traffic, the lane configurations at the signalized intersections would remain unchanged relative to the No Build Alternative. The intersections at New Hampshire Avenue, Riggs Road, and Adelphi Road would be crossed at grade using the existing traffic signals.

After crossing Adelphi Road, this alternative would continue eastward through the University of Maryland – College Park campus on Campus Drive until reaching the ‘M’ Circle at Regents Drive. Campus Drive would be closed to through vehicle traffic between Union Lane and the ‘M’ Circle (except for other transit vehicles, emergency services, and University service vehicles), consistent with the University’s Master Plan. Automobile traffic through campus would be re-routed to Paint Branch Drive, Regents Drive, and Stadium Drive. The ‘M’ Circle would be re-configured into a pair of T-intersections. The alternative would turn slightly south and enter a new exclusive right-of-way along at grade in a new exclusive transitway through the parking lots adjacent to the Armory, behind the Visitors Center to Rossborough Lane.

Passing behind the Visitor’s Center the alignment would turn onto Rossborough Lane. This new exclusive right-of-way would intersect US 1 at grade as the fourth leg of the existing intersection of US 1 and Rossborough Lane, which will be maintained as part of the proposed East Campus Development. The alternative would then continue through the East Campus Development, along Rossborough Lane, in dedicated transit lanes to Paint Branch Parkway.

The alignment would continue on Paint Branch Parkway and River Road in shared lanes, as with Low Investment BRT. The transit vehicles would turn right onto River Road and access the existing bus loop at the station. The alignment would then follow River Road to Kenilworth Avenue in shared lanes.

At the intersection of River Road and Kenilworth Avenue, this alternative would turn into two newly constructed dedicated transit curb lanes (all widening of Kenilworth Avenue to

accommodate these lanes would occur west of the existing western curb line) on Kenilworth Avenue. The signal phasing along northbound Kenilworth Avenue would be modified to eliminate potential conflicts between northbound through traffic and left-turning bus rapid transit vehicles.

The alignment would then turn left onto East West Highway and operate in dedicated curb lanes. The turn from Kenilworth Avenue to East West Highway could be accommodated with minor adjustments to the signal phasing at the intersection and some minor geometric modifications (shifting of stop bars) to accommodate the turning radius of the bus rapid transit vehicle. The alternative would continue east along East West Highway in dedicated transit lanes until reaching the diamond interchange at the Baltimore-Washington Parkway. At the intersections of the northbound and southbound off-ramps, a new signal phase would be added to allow the alternative to leave its dedicated transit lanes and enter the shared lanes beneath the Baltimore-Washington Parkway overpasses. After clearing the overpasses, the alternative would then re-enter dedicated transit curb lanes. The alignment would then turn onto Veterans Parkway in shared lanes. The alternative would then cross Annapolis Road at grade and would continue to Ellin Road before using the traffic signal at Ellin Road to turn into dedicated transit lanes (all widening along Ellin Road would occur to the south of the existing curb line). The alignment would then terminate at the New Carrollton Metro Station.

### **Medium Investment BRT Variations Serving the Medical Center Area**

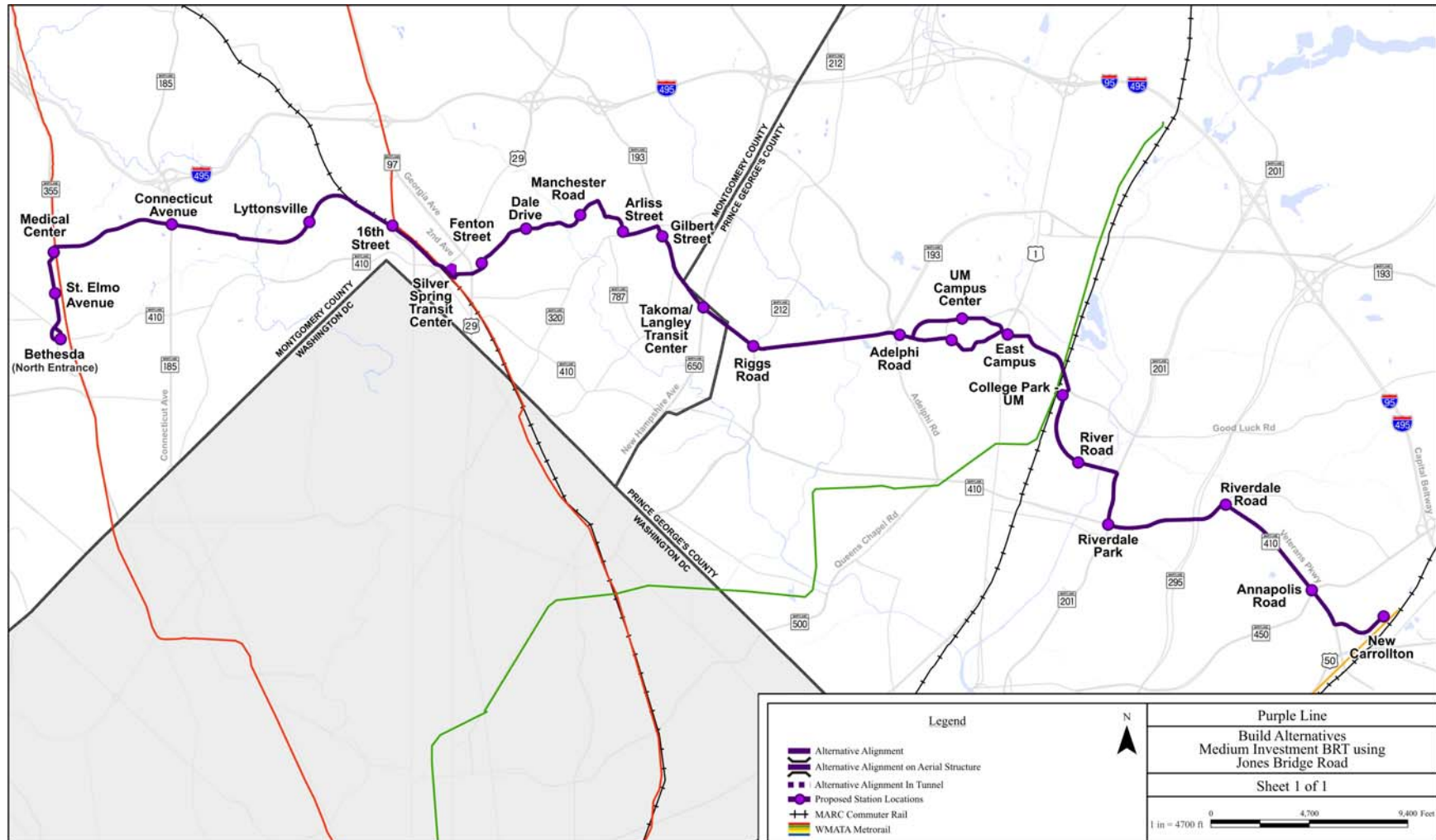
The Town of Chevy Chase has raised concerns regarding the transit service provided by the Purple Line alternatives to the National Institutes of Health and the National Naval Medical Center (NNMC). With the exception of Low Investment BRT, all the alternatives provide improved bus service between Silver Spring and NNMC as well as the option to transfer to the Metro Red Line at Bethesda to reach NNMC. Low Investment BRT provides more direct service to NNMC, but less direct service to downtown Bethesda by traveling along Jones Bridge Road to the Medical Center area and then along Woodmont Avenue to Bethesda.

Because Low Investment BRT does not have the travel time benefits afforded by Medium Investment BRT east of Jones Mill Road, the Town of Chevy Chase proposed a variation of Medium Investment BRT which uses Jones Bridge Road west of Jones Mill Road, instead of using the county-owned Master Plan alignment that goes directly to Bethesda (see Figure 2-5). This variation would include an additional stop at St. Elmo Street on Woodmont Avenue.

Another variation that would directly serve the Medical Center area would extend the service of Medium Investment BRT from the north entrance of the Bethesda Metro Station, up Woodmont to the NNMC, also including a station at St. Elmo Street (see Figure 2-6). Both variations provide the benefits of Medium Investment BRT and provide a one-seat ride to the Bethesda and NNMC.

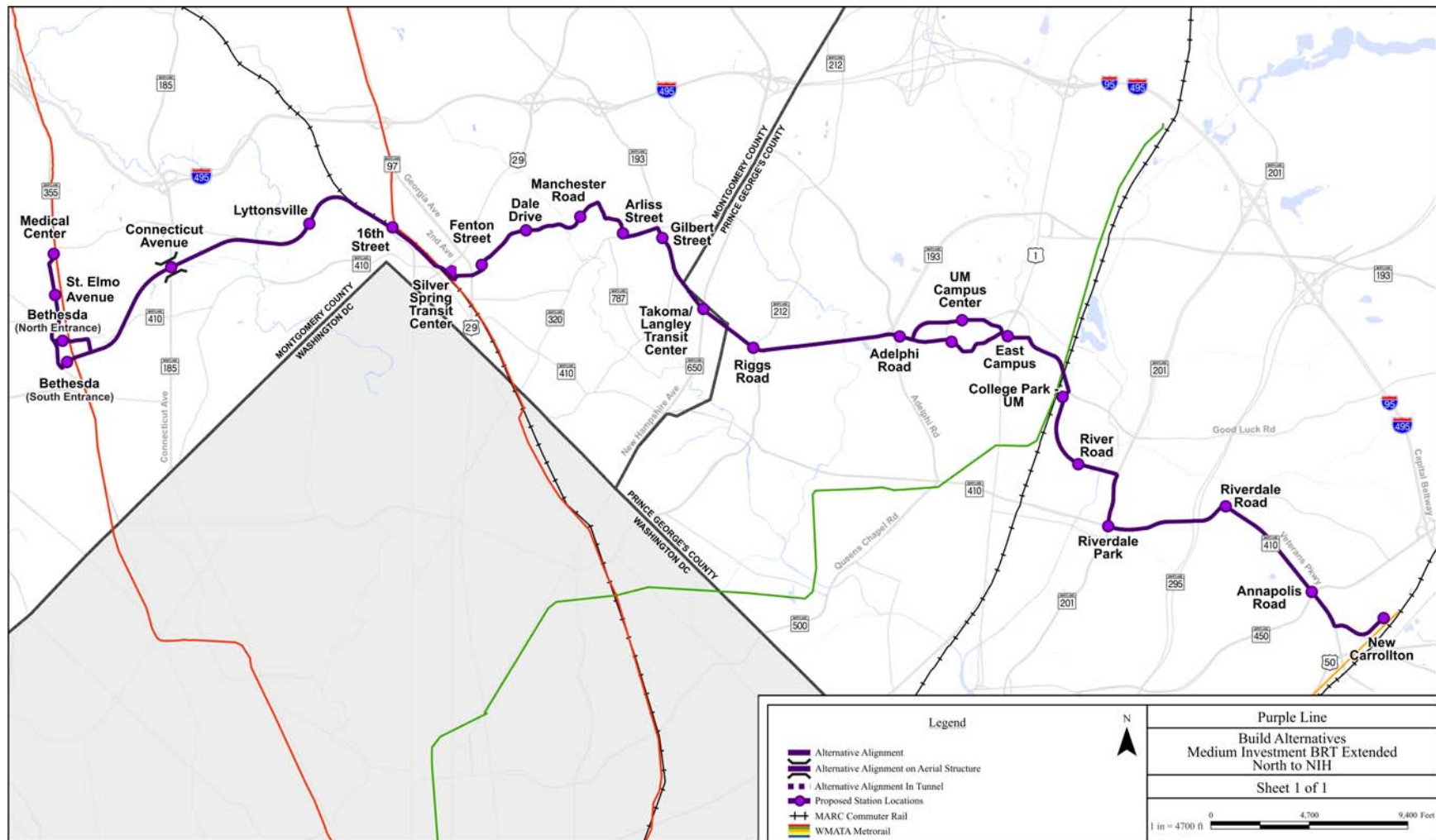


**Figure 2-5: Medium Investment BRT Using Jones Bridge Road**





**Figure 2-6: Medium Investment BRT Extended North to NIH**





### **2.3.5. Alternative 5 – High Investment BRT**

The High Investment BRT Alternative (Figure 2-7) is intended to provide the most rapid travel time of the BRT alternatives. It would make maximum use of vertical grade separation and horizontal traffic separation. Tunnels and aerial structures are proposed at key locations to improve travel time and reduce delay. When operating within or adjacent to existing roads, this alternative would operate primarily in dedicated lanes. Like the Medium Investment BRT this alternative that would serve the Bethesda Station both at the existing Bethesda bus terminal at the Metro station and at the new south entrance to the Metro station beneath the Apex Building.

High Investment BRT would follow a one-way loop in Bethesda from the Master Plan alignment onto Pearl Street, then travel west on East West Highway and Old Georgetown Road into the Bethesda Metro Station bus terminal, exit onto Woodmont Avenue southbound, and then continue left under the Air Rights Building to rejoin the Georgetown Branch right-of-way. Elevators would provide a direct connection to the south end of the Bethesda Metro Station in the tunnel under the Air Rights Building.

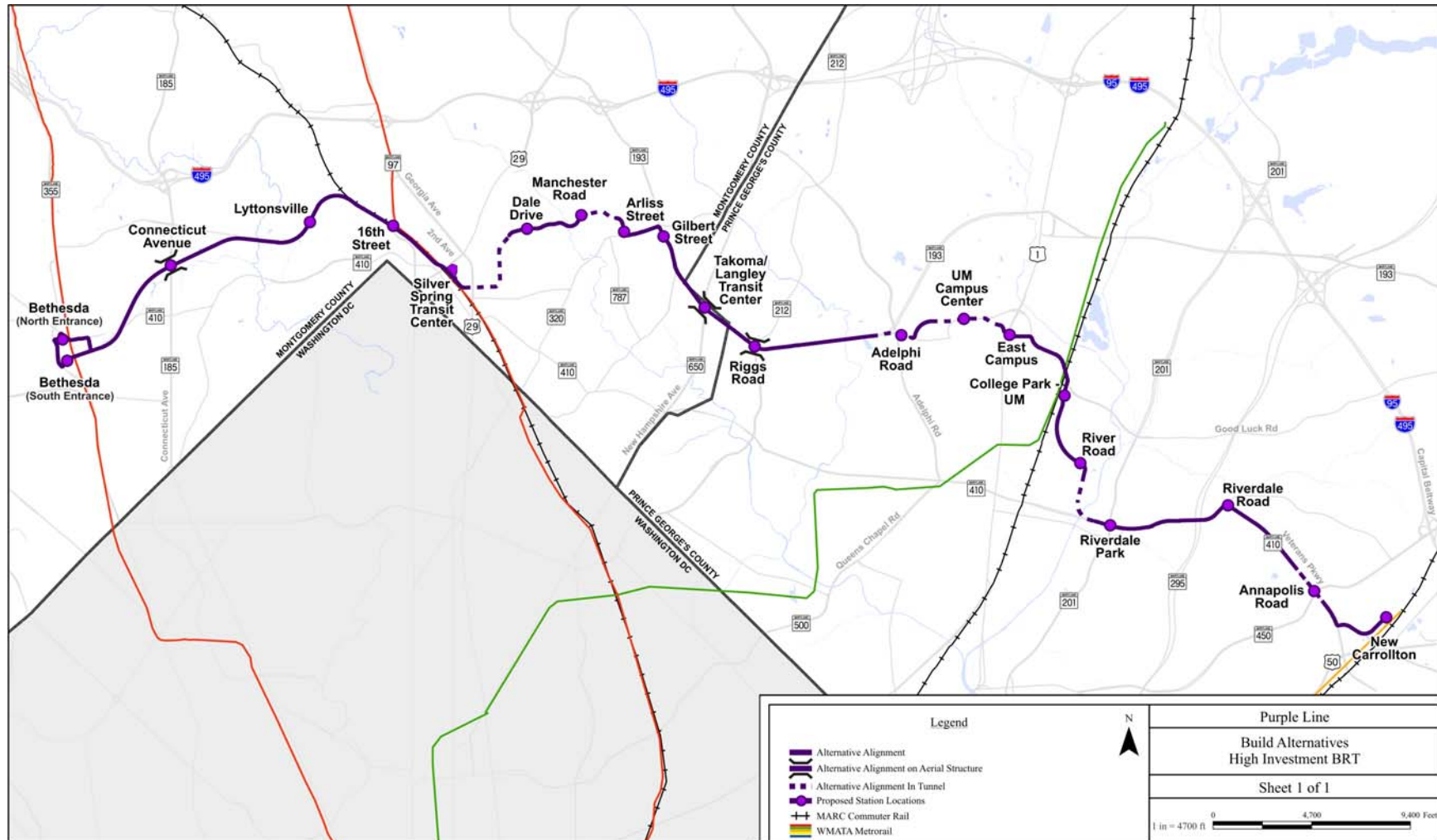
The High Investment BRT alignment would be the same as Medium Investment BRT until it reaches the CSX corridor, with a bridge over Connecticut Avenue and an underpass under Jones Mill Road. As with the Low and Medium Investment BRT alternatives, this alternative would follow the CSX corridor on the south side of the right-of-way, but it would cross 16<sup>th</sup> Street and Spring Street below the grade of the streets, at approximately the same grade as the CSX tracks. The station at 16<sup>th</sup> Street would have elevators or escalators to provide access from 16<sup>th</sup> Street.

The crossing of the CSX right-of-way would be the same as for Medium Investment BRT. After passing under Spring Street, the Medium Investment BRT would rise above the level of the existing development south of the CSX right-of-way. East of the Falklands Chase apartments, Medium Investment BRT would cross over the CSX tracks on an aerial structure to enter the Silver Spring Transit Center parallel to, but at a higher level than, the existing tracks.

From the Silver Spring Transit Center, High Investment BRT would continue along the CSX tracks until Silver Spring Avenue, where the alignment would turn east entering a tunnel, passing under Georgia Avenue, and turning north under Grove Street to Wayne Avenue. The alignment would return to the surface on Wayne Avenue between Cedar Street and Dale Drive. To accommodate the tunnel portal on Wayne Avenue and provide a higher level of transit service, Wayne Avenue would be reduced from two to one travel lane in each direction. The second existing travel lane would be converted to transit-only use. All on-street parking on Wayne Avenue would be eliminated. New eastbound and westbound left-turn lanes would be provided at the existing traffic signal at Dale Drive and the westbound left-turn movement at the signalized intersection at Mansfield Road would be restricted and that traffic would be re-routed to the intersection at Dale Drive. A new eastbound left-turn lane would be added at Sligo Creek Parkway to accommodate automobile traffic.



**Figure 2-7: High Investment BRT**





East of Sligo Creek Parkway, Wayne Avenue would be widened by two lanes to provide a dedicated transit lane in the median in each direction. At a point 900 feet east of Sligo Creek Parkway, the High Investment BRT Alternative would turn from Wayne Avenue and enter a tunnel section beneath Plymouth Street. A new signal would be required along Wayne Avenue to allow transit vehicles to enter and exit the median of Wayne Avenue. The tunnel section would cross under Flower Avenue and return to grade along Arliss Street, just east of Flower Avenue.

The alternative would turn left onto Piney Branch Road, which would be widened to accommodate one new dedicated transit lane in each direction; the High Investment BRT Alternative would operate in the median. The existing two-way left-turn lane between Arliss Street and Barron Street would be removed, and the unsignalized access points along this segment of Piney Branch Road would be converted to right-in/right-out access.

At University Boulevard, the alternatives would turn right onto University Boulevard, which would be widened to accommodate one new dedicated transit lane in each direction. The alternative would operate in a protected median section. Along University Boulevard, for automobile traffic, the lane configurations at the signalized intersections would remain unchanged relative to the No Build Alternative. For the High Investment BRT Alternative the signal phasing for the eastbound and westbound left turns at all signalized intersections would need to be converted to protected-only phasing due to the presence of the median-running transitway. A number of existing unsignalized median breaks along University Boulevard may need to be closed to automobile traffic; new traffic signals or active warning signing will also be considered at the remaining locations. The treatment of these unsignalized intersections will be addressed in greater detail during the Preliminary Engineering phase. At the intersections at New Hampshire Avenue and Riggs Road grade-separated crossings for transit vehicles would be provided.

Approaching University of Maryland, the alignment would cross under Adelphi Road. After crossing Adelphi Road, the High Investment BRT Alternative would continue in a tunnel beneath the center of the campus. This alignment would return to grade east of Regents Drive in a new exclusive right-of-way along the south side of the campus intramural playing fields. This new exclusive right-of-way would be same as described for Medium Investment BRT. From here the alignment would be the same as Medium Investment BRT through the East campus development.

The alignment would continue east on Paint Branch Parkway in dedicated lanes. Paint Branch Parkway would be widened to provide one new dedicated transit lane in each direction, west of the existing signal at the intersection of Paint Branch Parkway and the Fire Academy. East of this intersection the transit vehicles would operate in mixed traffic within the existing travel lanes beneath the CSX overpass. To accommodate the transition from the new dedicated transit lanes to shared travel lanes, a new signal phase would be required at the Fire Academy signal to time-separate the transit and automobile movements.

The High Investment BRT would leave Paint Branch Parkway shortly after the WMATA parking garage entrance onto an exclusive right-of-way through a proposed development at the

existing College Park Metro Station development site. The alternative would then follow River Road in dedicated lanes.

This alternative would turn from River Road, east of Rivertech Court, and enter a tunnel that would pass underneath an existing park and stream. This tunnel would return to grade in the median of East West Highway, just west of its existing signalized intersection with Kenilworth Avenue. This alternative would cross Kenilworth Avenue at grade and continue east along East West Highway in two new dedicated transit lanes in the median. The existing turning lane would be maintained at the signalized intersections along East West Highway; however, the signal phasing would be modified along East West Highway to convert the eastbound and westbound left turns to protected-only movements. The existing overpasses at the Baltimore-Washington Parkway would be lengthened as part of this alternative and the High Investment LRT Alternative, which would continue east and then turn right into the median of Veterans Parkway.

This alternative would then continue east in new dedicated transit lanes constructed in the existing median of Veterans Parkway and, unlike Medium Investment BRT, would pass under the intersection of Veterans Parkway and Annapolis Road. The alignment would then turn left from the median of Veterans Parkway onto Ellin Road; two new dedicated transit lanes would be constructed on the south side of Ellin Road. A new gate arm or traffic signal would be required at Hanson Oaks Court to separate automobile and transit movements at this unsignalized crossing. These alternatives would then terminate near the New Carrollton Metro Station.



### **2.3.6. *Alternative 6 – Low Investment LRT***

The Low Investment LRT Alternative (Figure 2-8) would operate in shared and dedicated lanes with minimal use of vertical grade separation and horizontal traffic separation. All LRT Alternatives would serve only the south entrance of the Bethesda Station and would operate there in a stub-end platform arrangement.

This alternative would begin on the Georgetown Branch right-of-way near the Bethesda Metro Station under the Air Rights Building. The hiker-biker trail connection to the Capital Crescent Trail would not be through the tunnel under the Air Rights Building, but rather through Elm Street Park on existing streets. The terminal station would be the Bethesda Metro Station with a connection to the southern end of the existing station platform.

After emerging from under the Air Rights Building, the Low Investment LRT would follow the Georgetown Branch right-of-way, crossing Connecticut Avenue at grade but crossing under Jones Mill Road. The at grade crossing of Connecticut Avenue would be accomplished by adding a new exclusive signal phase to serve LRT movements at the intersection of Connecticut Avenue and Chevy Chase Lakes Drive.

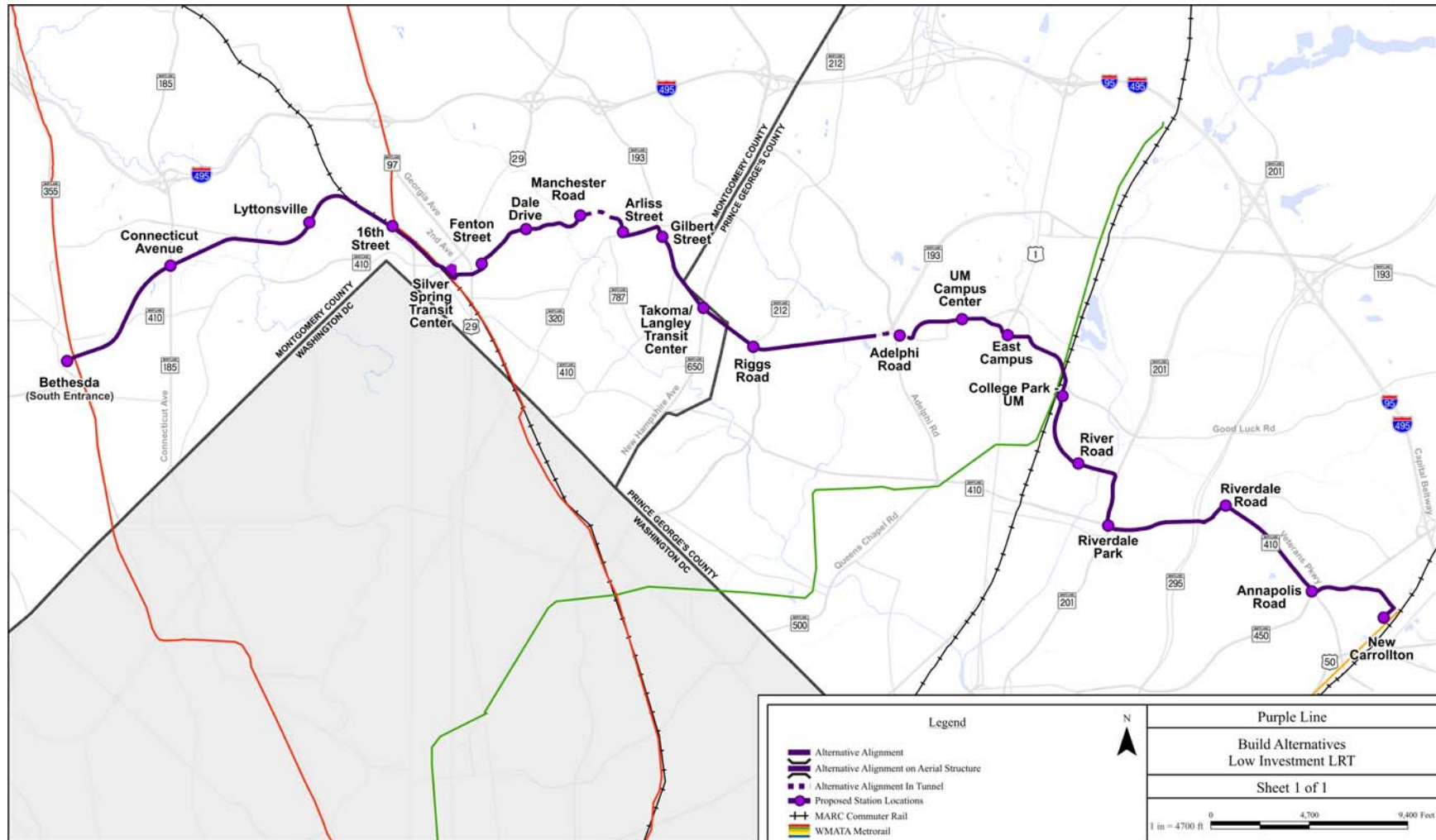
The segment from Jones Mill Road to Spring Street in the CSX corridor would be the same as for Low and Medium Investment BRT with the transitway crossing 16<sup>th</sup> and Spring Streets at grade at new signalized intersections.

After crossing Spring Street, Low Investment LRT would be the same as the Medium and High Investment BRT Alternatives, crossing the CSX right-of-way east of the Falklands Apartments and entering the Silver Spring Transit Center. This alternative would exit the Silver Spring Transit Center and turn onto Bonifant Street where it would operate at grade in dedicated transit lanes on the north side of Bonifant Street. Two-way traffic would be maintained on Bonifant Street between Georgia Avenue and Fenton Street; this would require the removal of on-street parking along the south curb of Bonifant Street.

Approaching Fenton Street, this alternative would turn left and tie into the existing signalized intersection of Fenton Street and Wayne Avenue as a new approach. The traffic signal would be modified to incorporate a new signal phase to accommodate transit movements. An exclusive westbound left turn lane for transit vehicles would be provided at Fenton Street. The Low Investment LRT would share the existing inside travel lane with left turning and through automobile traffic at Cedar Street. This alternative would then continue east, passing through Cedar Street on Wayne Avenue.

The light rail transit would function as a streetcar east of Cedar Street; the tracks for the alternative would be constructed in the existing inside travel lane in each direction along Wayne Avenue; two travel lanes would be maintained in each direction: the outside travel lanes would carry regular traffic and the inside travel lanes would carry mixed traffic (LRT and autos). The alternative would cross Sligo Creek Parkway Under this alternative the light-rail vehicles in both directions would share the inside travel lanes with left-turning and through passenger car traffic.

### Figure 2-8: Low Investment LRT







At a point approximately 900 feet east of Sligo Creek Parkway, the Low Investment LRT Alternative would turn off of Wayne Avenue into a tunnel section beneath Plymouth Street because the grade of Wayne Avenue is too steep for LRT vehicles at this point. A new traffic signal would be required along Wayne Avenue at this location to permit light rail transit vehicles to enter and exit Wayne Avenue. It would return to grade along Arliss Street, just east of Flower Avenue as with High Investment BRT.

The Low Investment LRT alternative would then follow Piney Branch Road and University Boulevard at grade in dedicated lanes as described for High Investment BRT. In keeping with the low investment definition of this alternative, the major intersections of New Hampshire Avenue and Riggs Road would not be grade-separated.

As this alternative approaches Adelphi Road, the grade of the existing roadway is too steep for the type of LRT vehicles being considered so the transitway would cross the intersection below grade.

At Adelphi Road, the alignment would enter the University of Maryland campus on Campus Drive. After crossing Adelphi Road, this alternative would continue eastward through the University of Maryland campus on Campus Drive until reaching the 'M' Circle at Regents Drive. Campus Drive would be closed to through vehicle traffic between Union Lane and the 'M' Circle (except for other transit vehicles, emergency services, and University service vehicles), consistent with the University's Master Plan. Automobile traffic through campus would be re-routed to Paint Branch Drive, Regents Drive, and Stadium Drive. The 'M' Circle would be re-configured into a pair of T-intersections. The alternative would turn slightly south and enter a new exclusive right-of-way along at grade in a new exclusive transitway through the parking lots adjacent to the Armory, behind the Visitors Center to Rossborough Lane. This segment of the alignment is the same as Medium Investment BRT.

Crossing US 1 at grade, Low Investment LRT would pass through the East Campus development on Rossborough Lane to Paint Branch Parkway. The alignment would continue on Paint Branch Parkway in shared lanes. The Low Investment LRT would leave Paint Branch Parkway shortly after the WMATA parking garage entrance onto an exclusive right-of-way through the proposed development at the existing College Park Metro Station.

The alignment would exit the College Park Metro Station and continue in a new exclusive right-of-way returning to dedicated lanes on the south side of River Road. This exclusive right-of-way would turn at Kenilworth Avenue and continue parallel to, and west of, Kenilworth Avenue. The tracks for the alternative would cross the western leg of the intersection of Rittenhouse Street at grade, making use of the existing traffic signal to provide time separation; the signal phasing at Rittenhouse Street would be modified to convert the northbound and southbound left turns to protected-only phasing. Two new gate arms would be required at Quesada Road and Quintana Street to prohibit unsignalized automobile movements when light rail vehicles are approaching.

The alignment would then turn left from Kenilworth Avenue into two dedicated transit lanes in the median of East West Highway. To accommodate these two dedicated median transit lanes, East West Highway would be restriped to eliminate the existing two-way left-turn lane and the



existing parking lanes along the north and south curb lanes. The existing signal phasing at the signalized intersections at Mustang Drive and 64<sup>th</sup> Place would not be modified; however, the left-turn movements from East West Highway would be made from the new median transit lanes, which would be shared for a short distance upstream of these intersections. The alternative would continue east along East West Highway in dedicated transit lanes until reaching the diamond interchange at the Baltimore-Washington Parkway. At the existing signalized intersections of the northbound and southbound MD 295 off-ramps, a new signal phase would be added.

On Veterans Parkway the LRT would be in dedicated lanes in the median.

As for Low Investment BRT, this alignment turns left on Annapolis Road from Veterans Parkway and then right on Harkins Road to the New Carrollton Metro Station, however the lanes on Annapolis would be dedicated in both directions as would the lanes on Harkins Lane.





### **2.3.7. *Alternative 7 – Medium Investment LRT***

The Medium Investment LRT Alternative (Figure 2-9) is a composite of elements from the Low and High LRT Investment Alternatives. The Medium Investment LRT Alternative incorporates those lower cost features for segments of the Low Investment LRT Alternative that perform reasonably and those of the High Investment LRT Alternative that provide reasonable benefits relative to their higher costs. The principal incremental change for the Medium Investment LRT Alternative is the introduction of several grade separations at major roadways and more dedicated sections along roadways; however, it does not include some of the longer tunnel sections in East Silver Spring or through the University of Maryland as included under the High Investment LRT.

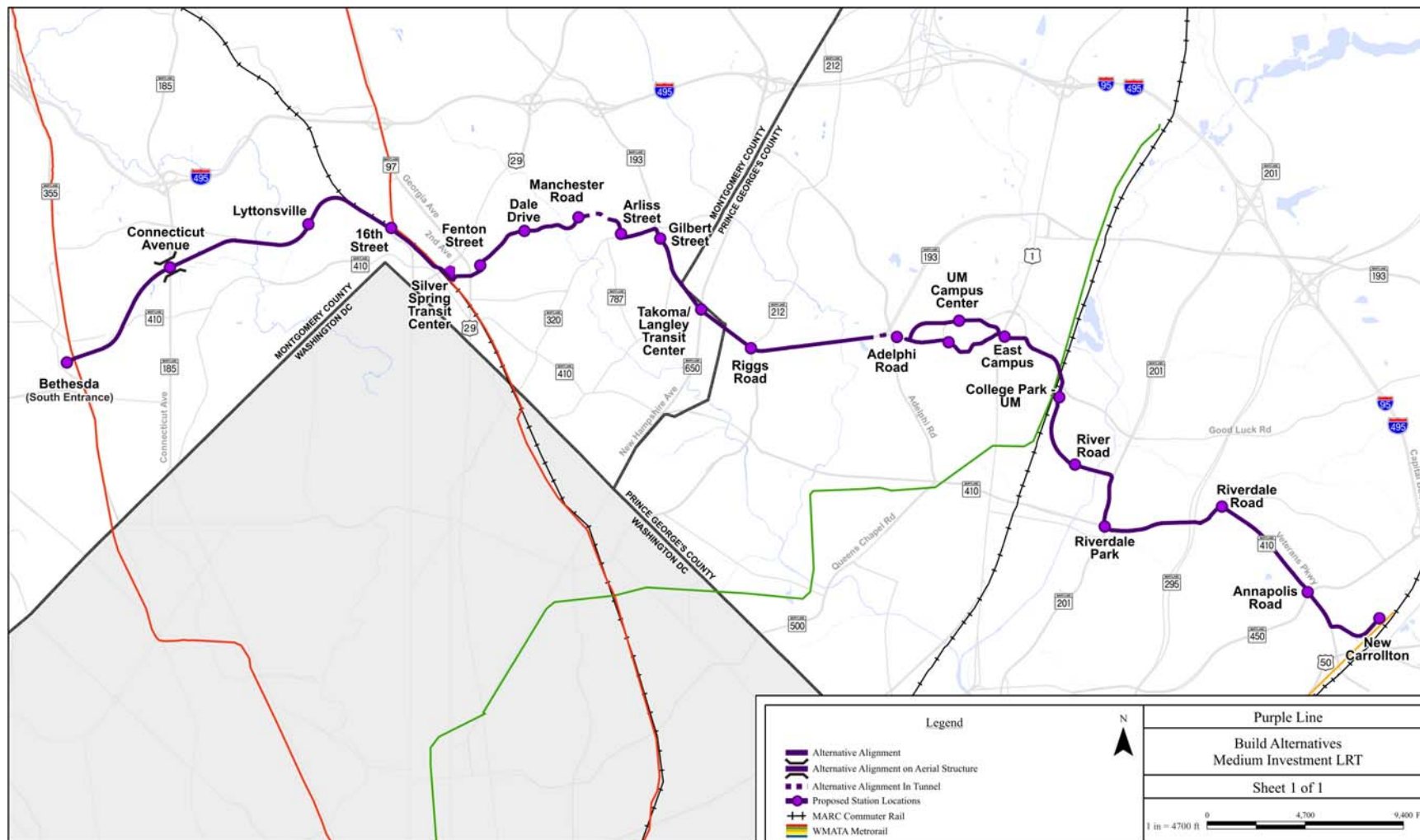
Medium Investment LRT is the same as Low Investment LRT from Bethesda to the CSX corridor, following the Georgetown Branch right-of-way, except that the alignment and the trail would cross over Connecticut Avenue on an aerial structure. As noted earlier, the construction of a permanent hiker–biker trail between Bethesda and Silver Spring is included.

Along the CSX corridor the alignment would be the same as High Investment BRT, grade-separated (below) at 16<sup>th</sup> and Spring Streets. The alignment would be the same as Medium and High Investment BRT and Low Investment LRT from Spring Street crossing the CSX corridor east of the Falklands Apartments, through the Silver Spring Transit Center.

From the Silver Spring Transit Center the Medium Investment LRT Alternative would turn onto Bonifant Street where it would operate at grade in dedicated transit lanes on the north side of Bonifant Street. Under this alternative, Bonifant Street, between Ramsey Street and Fenton Street, would be converted from two-way operation to one-way operation (either eastbound or westbound). On-street parking would remain along the south curb. The very low volume of westbound or eastbound traffic currently using Bonifant Street between Fenton Street and Georgia Avenue would be diverted to Thayer Avenue, one block to the south. Some minor widening of Bonifant Street is expected between Ramsey Street and Georgia Avenue, where these alternatives would cross at grade using the existing traffic signal. The slight modification would accommodate the conversion of Bonifant Street to one-way operation.

Approaching Fenton Street, these alternatives would turn left and tie into the existing signalized intersection of Fenton Street and Wayne Avenue as a new approach. The traffic signal would be modified to incorporate a new signal phase to accommodate transit movements. This alternative would then continue east, passing through Cedar Street on Wayne Avenue. Wayne Avenue would be widened by one lane between Cedar Street and Fenton Street to accommodate an exclusive westbound left-turn lane for transit vehicles at Fenton Street and a new eastbound left-turn bay for automobile traffic at Cedar Street.

**Figure 2-9: Medium Investment LRT**





The LRT would function as a streetcar east of Cedar Street; the tracks would be constructed in the existing inside travel lane in each direction along Wayne Avenue; two travel lanes would be maintained in each direction: the outside travel lanes would carry regular traffic and the inside travel lanes would carry mixed traffic (LRT and autos). At the existing signalized intersection at Dale Drive, a new left-turn lane for automobile traffic would be provided in the eastbound and westbound directions. If a station is provided to the east of Dale Drive, then a westbound left-turn lane would not be provided due to engineering constraints. Instead, a dedicated pedestrian pathway would be constructed in the median to allow pedestrians to safely access the station using the signalized crossings at Dale Drive.

For the Medium LRT Alternative, new eastbound and westbound left turn lanes would be provided at Sligo Creek Parkway. East of Sligo Creek Parkway, Wayne Avenue would be widened by two lanes to provide two dedicated transit lanes in the median. At a point approximately 900 feet east of Sligo Creek Parkway, the alternative would turn off of Wayne Avenue into a tunnel section beneath Plymouth Street. A new traffic signal would be required along Wayne Avenue at this location to permit light rail transit vehicles to enter and exit Wayne Avenue. It would return to grade along Arliss Street, just east of Flower Avenue and continue in dedicated lanes on Piney Branch Road as described for High Investment BRT.

At University Boulevard, the alternative would turn right onto University Boulevard, which would be widened to accommodate one new dedicated transit lane in each direction. The alternative would operate in a protected median section. Along University Boulevard, for automobile traffic, the lane configurations at the signalized intersections would remain unchanged. The treatment of these unsignalized intersections will be addressed in greater detail during the Preliminary Engineering phase. The intersection at Adelphi Road would be grade-separated. This segment is that same as Low Investment LRT.

At Adelphi Road, the alignment would enter the University of Maryland campus on Campus Drive. The alignment would follow the Campus Drive alignment to the College Park Metro Station via Rossborough Lane, as described for Medium Investment BRT and Low Investment LRT. After crossing Adelphi Road, this alternative would continue eastward through the University of Maryland campus on Campus Drive until reaching the 'M' Circle at Regents Drive. Campus Drive would be closed to through vehicle traffic between Union Lane and the 'M' Circle (except for other transit vehicles, emergency services, and University service vehicles), consistent with the University's Master Plan. Automobile traffic through campus would be re-routed to Paint Branch Drive, Regents Drive, and Stadium Drive. The 'M' Circle would be re-configured into a pair of T-intersections. The alternative would turn slightly south and enter a new exclusive right-of-way along at grade in a new exclusive transitway through the parking lots adjacent to the Armory, behind the Visitors Center to Rossborough Lane. This segment of the alignment is the same as Medium Investment BRT.

Crossing US 1 at grade, Medium Investment LRT would pass through the East Campus development on Rossborough Lane to Paint Branch Parkway.

Leaving the East Campus development on Paint Branch Parkway it would be in dedicated lanes, except under the CSX/metro tracks at the College Park Metro Station as described for High Investment BRT. The Medium Investment LRT would follow River Road, Kenilworth Avenue,



East West Highway, and Veterans Parkway in dedicated lanes as described for Low Investment LRT.

At the intersection of Veterans Parkway and Annapolis Road the LRT would cross Annapolis Road at grade, turning left at Ellin Road still in dedicated lanes.



### **2.3.8. *Alternative 8 – High Investment LRT***

The High Investment LRT Alternative (Figure 2-10) would be exactly the same as the High Investment BRT Alternative, except for the Bethesda terminus. The alignment would begin just west of the tunnel under the Air Rights Building. The hiker-biker trail would follow the alignment through the tunnel under the Air Rights Building. Because of physical constraints, the trail would be elevated above the westbound tracks. The trail would return to grade as it approaches Woodmont Avenue. The terminal station would be the Bethesda Metro Station with a connection to the southern end of the existing station platform.

High Investment LRT is intended to provide the most rapid travel time of the LRT alternatives. It would make maximum use of vertical grade separation and horizontal traffic separation. Tunnels and aerial structures are proposed at key locations to improve travel time and reduce delay. When operating within or adjacent to existing roads, this alternative would operate primarily in dedicated lanes. High Investment LRT would be the same as the High Investment BRT Alternative, except for the Bethesda terminus. The alignment would begin just west of the tunnel under the Air Rights Building. The hiker biker trail would follow the alignment through the tunnel under the Air Rights Building. Because of physical constraints, the trail would be elevated above the westbound tracks. The trail would return to grade as it approaches Woodmont Avenue. The terminal station would be the Bethesda Metro Station with a connection to the southern end of the existing station platform.

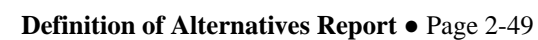
High Investment LRT would begin under the Air Rights Building on the Georgetown Branch right-of-way. Elevators would provide a direct connection to the south end of the Bethesda Metro Station in the tunnel under the Air Rights Building.

The High Investment LRT alignment would be the same as Medium Investment LRT until it reaches the CSX corridor. As with the other alternatives, this alternative would follow the CSX corridor on the south side of the right-of-way, and like Medium Investment LRT, it would cross 16<sup>th</sup> Street and Spring Street below the grade of the streets, at approximately the same grade as the CSX tracks. The station at 16<sup>th</sup> Street would have elevators and escalators to provide access from 16<sup>th</sup> Street.

The crossing of the CSX right-of-way would be the same as for Medium Investment LRT. From the Silver Spring Transit Center, High Investment LRT would continue along the CSX tracks until Silver Spring Avenue, where the alignment would turn east entering a tunnel, passing under Georgia Avenue, and turning north to Wayne Avenue. The alignment would return to the surface on Wayne Avenue near Cedar Street. It would continue on Wayne Avenue in dedicated lanes, crossing Sligo Creek Parkway, and entering a tunnel approximately half-way between Sligo Creek and Flower Avenue, then turning east to pass under Plymouth Street, crossing under Flower Avenue, and emerging from the tunnel on Arliss Street.

High Investment LRT would be the same as Medium Investment LRT on Piney Branch Road and University Boulevard except that the alignment would have grade-separated crossings over New Hampshire Avenue and Riggs Road.







Approaching University of Maryland, the alignment would cross under Adelphi Road. After Adelphi Road the alignment would follow Campus Drive and turn onto the proposed Union Drive extended. The alignment would enter a tunnel while on Union Drive, prior to Cole Field House, and pass through the campus under Campus Drive. After emerging from the tunnel east of Regents Drive, the alignment would be the same as Medium Investment LRT until Paint Branch Parkway, crossing US 1 at grade; it would pass through the East Campus development on Rossborough Lane to Paint Branch Parkway.

The alignment would continue east on Paint Branch Parkway in shared lanes to the College Park Metro Station. The LRT would enter the College Park Metro Station next to the existing parking garage.

The alternative would then follow River Road in dedicated lanes on the south side of the road. From River Road near Haig Drive, the alternative would turn right and enter a tunnel heading south, roughly parallel to Kenilworth Avenue. Near East West Highway (MD 410), the alignment would turn left and continue in the tunnel under Anacostia River Park. The alignment would transition to a surface alignment west of the Kenilworth Avenue/East West Highway intersection. The alternative would follow East West Highway in dedicated lanes.

High Investment LRT would turn right down Veterans Parkway in dedicated lanes. Unlike Medium Investment LRT, this alternative would cross under Annapolis Road before continuing on Ellin Road to the New Carrollton Metro Station.



### **2.3.9. Design Options**

#### **North Side of CSX Design Option**

This design option is based on the Georgetown Branch Master Plan. From the eastern end of the Georgetown Branch right-of-way the alignment would cross under the CSX corridor and then continue down the north side of the corridor. It would emerge from the tunnel near Lyttonsville Road in Woodside. The alignment would be below the grade of 16<sup>th</sup> Street, passing under the bridge, but providing a station at that location. It would also pass under the Spring Street bridge but would begin to rise on an aerial structure over the CSX right-of-way 1,000 feet northwest of Colesville Road due to the location of the Metro Plaza building. The aerial structure over the CSX right-of-way would provide the required 23-foot clearance from top of rail to bottom of structure. The alternative would enter the Silver Spring Transit Center parallel to, but at a higher level than, the existing tracks. The original Georgetown Branch Master Plan was for a four-mile single track transitway. The expansion of the project to 16 miles made the use of single track operationally problematic. A double track alignment has substantial differences due to the physical constraints of this section of the corridor. Compounding this was the fact that the CSXT Corporation expanded the width of the separation they required from the center line of their track to a crash wall between other uses. This required separation had been 15 feet but was expanded to 25 feet in 2001.

#### **South Side of CSX with a crossing west of the Falklands Apartments Design Option**

This option would operate on the south side of the CSX, as described either at or below grade at 16<sup>th</sup> Street. The alignment would cross the CSX corridor between Spring Street and Fenwick Lane. This option would continue along the north side of the CSX right-of-way on an aerial structure over the CSX right-of-way 1,000 feet northwest of Colesville Road, due to the location of the Metro Plaza building. The aerial structure over the CSX right-of-way would provide the required 23-foot clearance from top of rail to bottom of structure. The alternative would enter the Silver Spring Transit Center parallel to, but at a higher level than, the existing tracks.

#### **Silver Spring/Thayer Avenue Design Option**

This design option is being considered for the High Investment BRT and LRT alternatives only. It would begin at the Silver Spring Transit Center where the alignment leaves the CSX corridor near Silver Spring Avenue. It would enter a tunnel on Silver Spring Avenue passing under Georgia Avenue and Fenton Street. At approximately Grove Street, the alignment would shift northward to continue under the storm drain easement and backyards of homes on Thayer and Silver Spring Avenues. The transitway would emerge from the tunnel behind the East Silver Spring Elementary School on Thayer Avenue and follow Thayer Avenue across Dale Drive to Piney Branch Road. If the mode selected were LRT, the grade of Piney Branch Road would require an aerial structure from west of Sligo Creek and Sligo Creek Parkway and would return to grade just west of Flower Avenue. This aerial structure requires that the road be widened. For this design option, a station would be located on Thayer Avenue where the alignment would emerge from the tunnel.



### **University of Maryland Campus via Preinkert/Chapel Drive Design Option**

Preinkert Drive is being evaluated as a design option for the Medium Investment BRT and LRT alternatives through the campus of the University of Maryland. The alignment would run from the west on Campus Drive turning right onto Preinkert Drive where it would head southeast. The transitway would turn left to pass directly between LeFrak Hall and the South Dining Campus Hall and then northeast through the Lot Y parking lot. From there, the alignment would run east along Chapel Drive between Memorial Chapel and Marie Mount Hall and eventually would pass to the south of Lee Building at Chapel Fields. The alignment would continue onto Rossborough Lane, passing directly north of Rossborough Inn to cross US 1, and continues east through the East Campus development.

#### ***2.3.10. Ancillary Facilities***

##### **Stations and Station Facilities**

Table 5 provides the station locations, the markets served, and the connecting transit service at each station.

Stations would include shelters, lighting, ticket vending machines, and possibly landscaping and benches, where appropriate. Intelligent Transportation Systems would be used to provide real-time information on transit services at the stations. The station platforms would be approximately 200 feet long and ten feet wide. The stations would usually be incorporated into the existing sidewalks, except where large ridership necessitates a wider platform. Where stations are in the median of a roadway they would likely be 12 to 15 feet wide to provide a greater sense of comfort for transit passengers. Although the actual design of the stations is not part of this stage of the project, the station design would make it readily identifiable as serving the Purple Line.

No new park-and-ride facilities would be constructed as part of the Purple Line. Parking garages exist near the Bethesda and Silver Spring Metro Stations, and at the College Park and New Carrollton Metro Stations.

Additional kiss-and-ride facilities would be considered at the following stations: Connecticut Avenue at the Georgetown Branch right-of-way and Lyttonsville. Silver Spring Transit Center, College Park, and New Carrollton already have kiss-and-ride parking facilities available and the Purple Line would not add more. It has been determined that kiss-and-ride facilities are not needed at the Takoma/Langley Transit Center.

##### **Maintenance and Storage Facilities**

LRT and BRT both require maintenance and storage facilities; however, the requirements in terms of location and size are not the same. LRT requires a facility located along the right-of-way while a BRT facility can be located elsewhere. Depending on the construction phasing and mode chosen, two maintenance facilities (one in Montgomery County and one in Prince George's County) are ideal.



The size of the facility depends on the number of vehicles required. A fleet of 40 to 45 LRT vehicles (including spares) would require approximately 20 acres. A BRT facility for the Purple Line would generally require facilities of similar size. The Purple Line would also require storage for non-revenue vehicles and equipment such as: maintenance, supervisory, and security vehicles.

Activities at the maintenance facility would include:

- Vehicle Storage area (tracks for LRT)
- Inspection/Cleaning
- Running Repairs
- Maintenance/Repair
- Operations/Security
- Parking
- Materials/Equipment Storage

Two sites improve operations by providing services and storage near the ends of the alignment. It is possible to have one site provide the majority of the services and the other function as an auxiliary site.

#### Existing Bus Maintenance Facilities

BRT requires a garage facility; however, this need could possibly be met by sharing an existing bus garage.

The following documents the current capacity, future capacity, and expansion plans at each of the identified bus facilities. Currently, WMATA, Montgomery County, and Prince George's County provide bus service within the corridor. These three agencies operate and maintain the Metrobus, Ride On, and TheBus, respectively. The sections below summarize which agencies have bus maintenance facilities in or around the corridor, the location of each facility, and current and future capacity issues.

#### WMATA

WMATA has two bus maintenance facilities located near the corridor that service Metrobus – the Landover Bus Garage at 3433 Pennsy Drive, Landover, and the Montgomery Bus Garage at 5400 Marinelli Road, Rockville. These maintenance facilities are located on either end of the corridor. Characteristics of these two facilities are described below.

The Landover bus facility is in Landover approximately 2 miles northeast of the New Carrollton Station. The facility is approximately 58,800 square feet in size and can accommodate up to 250 buses. According to 2006 numbers, the facility currently maintains and stores 167 buses, although WMATA reports describe the facility as being “fully utilized.” The majority of buses stored at this facility are diesel-propelled coaches, 40 foot and under in length. The Montgomery bus facility is located in Rockville approximately 5 miles north of the Bethesda Station. The



facility is approximately 65,000 square feet in size and can accommodate up to 250 buses. According to 2006 numbers, the facility currently maintains and stores 163 buses but, like the Landover Garage, is described as being “fully utilized.” The majority of buses stored at this facility are diesel-propelled coaches, 60 foot and under in length.

#### Montgomery County – Ride On

Montgomery County has one bus maintenance facility in Lyttonsville to service its Ride On vehicles. This facility is adjacent to the Georgetown Branch right-of-way on Brookville Road and currently maintains 140 buses with projections of reaching 150 buses in the very near future. This facility sits on 50 to 60 acres and has a cross discipline of uses, including highway services, a fueling facility, and salt domes. This facility maintains a variety of 40-foot low-floor buses, including a small percent of 40-foot hybrid buses, 35-foot and 30-foot buses. The bus facility has a bus wash but does not have pull through bus maintenance bays, which would make maintenance on a 60-foot articulated bus difficult.

Montgomery County does plan to build a new bus maintenance facility in 2012-2013 in Clarksburg. However, Clarksburg is over 20 miles from Bethesda, which is too far to serve the Purple Line.

#### Prince George’s County – TheBus

Prince George’s County does not have a bus maintenance facility close to the corridor. The closest maintenance facility is in Forestville south of Largo, ten miles south of New Carrollton. This facility currently maintains and stores approximately 90 buses, which is about half of its designed capacity. The maintenance facility is not expected to reach capacity until at least 2012.

#### Purple Line Maintenance and Storage Facility Sites

A site for a maintenance and storage facility has been identified on Brookville Road in the Lyttonsville area in Montgomery County where the County’s Ride On buses and school buses are currently serviced. The Purple Line would require the use of some additional adjacent property. This site could serve either BRT or LRT.

In Prince George’s County, a site has been identified on the south side of Veterans Parkway near the West Lanham Shopping Center. This site, the Glenridge Maintenance Facility, is owned by M-NCPPC and currently being used as a maintenance facility for park vehicles.

These two sites provide sufficient capacity for either BRT or LRT operations; and are well located near either end of the alignment.

Several other sites were evaluated. These sites are:

**Rivertech Court** – This site, off River Road was considered for a maintenance and storage facility. Initially suggested to the MTA by the University of Maryland, the University later announced its intention to sell the property to developers making it no longer available to the MTA.

**North Veterans Parkway** – This site, located on the north side of Veterans Parkway, is heavily wooded with over 23 acres of forest. The site includes approximately 380 linear feet of streams and 21 acres of highly erodible soils. Because the site includes steep grades it would require extensive grading. This site has substantial environmental impacts and because of the required grading and retaining walls, a high cost. For this reason it was dropped from further consideration.

**MTA New Carrollton Property** – This site is property owned by the MTA on the east side of the New Carrollton Metro Station. This site includes over two acres of wetlands and 1500 linear feet of streams. In addition it is not particularly conveniently located because it would require the Purple Line to pass under or around the New Carrollton Metro Station. While there is support for extending the Purple Line farther east, and the present project is being planning not to preclude such a future extension, this site would have major costs due to its location east of the New Carrollton Station and tracks. Because of this and because of the substantial water resource impacts, this site was dropped from further consideration.

**Haig Court** – located on River Road at Haig Court. This site would have only required minimal grading but it includes over 7 acres of forest. It is also very close to the residential neighborhood of Riverdale Park, which is a historic district. This site was dropped from further consideration because of concern about impacts to the community.

### **Traction Power Substations**

Light rail's electric traction power system requires electrical substations approximately every 1.25 miles depending on the frequency and size of the vehicles. These substations, which are approximately 10 feet by 40 feet, do not need to be immediately adjacent to the tracks. This flexibility means the substations can be located to minimize visual intrusions and they can be visually shielded, either by fencing, landscaping, or walls, or they can be incorporated into existing buildings. The number and location of these substations will be determined during the preliminary engineering phase of project development.

The LRT would be powered by an overhead electrical system. This system would include overhead wires used to power the vehicles, poles to support the wires and the traction power substations described above. The overhead wire technology selected by the MTA would be a trolley wire. Trolley wire is a single wire system suspended by poles 17 to 22 feet about the street over each track. The poles would be located either between the two tracks, or on either side of the roadway, depending on the configuration of the alternative at that particular location. The poles are typically located every 100 to 120 feet. Where curves are sharp the poles and support wires would need to be more closely spaced.







## **Appendix A**

# **Metrorail Loop Proposal Alignment Evaluation**





# METRORAIL LOOP PROPOSAL

## Alignment Evaluation



March 2005





## INTRODUCTION

The Metrorail Loop proposal calls for a Metrorail connection from the existing Medical Center/National Institute of Health (NIH) Metrorail Station in Bethesda north via a tunnel under the Capital Beltway and along the north side of the Beltway primarily on aerial structure, and crossing back over the Beltway and continuing south along the CSX corridor either in a retained cut or in tunnel to the Silver Spring Transit Center (See Figure 1).

## BACKGROUND & PLANNING PROCESS

- MTA's 1996 Georgetown Branch Transitway/Trail Major Investment/Draft Environmental Impact Statement and SHA/MTA's 2002 Capital Beltway/Purple Line Corridor Transportation Study both examined a range of transportation alternatives between Bethesda and Silver Spring. Heavy rail alternatives along the beltway were not recommended by either study because they were determined not to meet the Purpose and Need and because of the high cost of heavy rail.
- In 2000 the General Assembly requested a Joint Chairman's Report evaluating an underground tunnel for the entire Georgetown Branch from Bethesda to Silver Spring. The report included a cost/benefits analysis of the several surface and tunnel alternatives, including Metrorail (heavy rail transit) option. The report determined that a heavy rail transit tunnel alternative would be extremely costly to construct, particularly relative to surface LRT, and would provide only minimal ridership gains; therefore a tunnel alignment was not justifiable from cost and cost-effectiveness perspectives and should not be considered further.
- In April 2002, MTA began the preparation of a Supplemental DEIS (SDEIS) for the Georgetown Branch. This study did not consider heavy rail because of its rejection by the previous studies.
- In the fall of 2002, a new project study was initiated, the Purple Line East, which proposed light rail service from Silver Spring to New Carrollton. Heavy rail transit was not included in the alternatives to be considered because of the finding of the previous SHA/MTA's 2002 Capital Beltway/Purple Line Corridor Transportation Study.
- In early January 2003, the staff of WMATA suggested an alternative to join the two sides of the Metrorail Red Line with a heavy rail transit rail link between the Naval Medical Center and Silver Spring stations, creating a "Red Line Loop." The Montgomery County Executive endorsed this line as an alternative alignment for the Inner Purple Line route.
- On January 8, 2003 the Montgomery County Council requested the Montgomery County Planning Board's review and make a recommendation regarding the Metrorail Loop proposal's feasibility and comparison to the master-planned Georgetown Branch alignment. The Planning Commission Staff (Maryland –National Capital Park & Planning Commission (M-NCPPC)) conducted a review of the Metrorail Loop proposal and recommended that the proposal should not be carried forward for further detailed study. Major factors in this decision were the fact that the project did not meet the existing Purpose and Need, the high cost and impacts, and the anticipated project delays that would arise from pursuing the new option at that time.
- On January 30, 2003 the Montgomery County Planning Board considered the report produced by M-NCPPC staff, public testimony and comments, testimony by the County Executive's staff, as well as answers to Planning Board questions provided by WMATA

and MTA. As a result, the Planning Board reaffirmed its support for the Purple Line along the master-planned Georgetown Branch alignment and recommended that the Metrorail Loop not be carried forward for detailed study. On February 4, 2003 the Montgomery County Council considered the Planning Board's recommendation and report on the Metrorail Loop proposal. The Council concurred with the Planning Board and passed a resolution urging the Governor and Maryland delegation to seek construction funding for the Purple Line along the established Master Plan alignment.

- In the summer of 2003, the Georgetown Branch/Purple Line West and Purple Line East studies were combined into one project, the Bi-County Transitway Study, to have consistent project goals and ensure that all build alternatives would be assessed from the perspective of the entire corridor.
- MTA initiated the Scoping Process for Bi-County Transitway Study in early September 2003. Four public scoping meetings were held in the corridor. The modal alternatives presented were:
  - No Build
  - Transportation System Management (TSM)
  - Bus Rapid Transit (BRT)
  - Light Rail Transit (LRT)
- The Metrorail Loop proposal was not one of the alternatives being considered as part of the Scoping Process, since a Metrorail alternative had been rejected in the previous studies. Comments were solicited from the public, including comments on the range of alternatives to be studied. Of the 1,319 comments received there were two comments recommending a heavy rail alignment along the Capital Beltway.
- On March 23, 2004, Montgomery County Director of the Department of Public Works and Transportation, Albert J. Genetti, sent a letter to the MTA requesting that MTA study the Metrorail Loop comprehensively, as required by the Council of Environmental Quality Regulations for Implementing NEPA. MTA agreed to further study of the alternative. In this evaluation, the alternative was determined to be even less appropriate to the goals and objectives of the project and in addressing the purpose and need than it had been to the earlier studies because of the required mode change at Silver Spring. In addition, the cost was projected to be considerably greater than the other proposed alternatives, and the environmental impacts more substantial than previously anticipated due to 4(f) impacts to parklands along the Beltway and greater impacts to communities along the CSX right-of-way.
- In November 2004 five public open houses were held as part of the Definition of Alternatives phase of the project. At these meetings the Metrorail Loop alignment was presented as an "Alignment Not Proposed for Detailed Study". MTA received no comments either supporting the construction of a heavy rail along the Beltway, or opposing the decision to drop the Metrorail Loop from consideration.
- At the request of FTA, Maryland Department of Transportation met with Maryland National Capital Park and Planning Commission, representing the Montgomery County Planning Commission and the County Council, and Montgomery County Department of Public Works, representing the County Executive, on January 14, 2005, to discuss the



reappraisal of the Metrorail loop and explain MTA's decision not to continue any further study of the alternative, with the MTA and M-NCPPC reaffirming their positions.

## **EVALUATION**

- The Metrorail Loop would be Heavy Rail Transit (HRT), which requires either a fully separated transitway or exclusive right-of-way, if built at-grade, in order to safeguard adjacent streets and pedestrians from the third rail.
- The Metrorail Loop proposal would provide high-speed travel between Bethesda and Silver Spring and improve operations for redundancy and flexibility to the Red Line Metrorail service by connecting the two radials of the current "U" shaped configuration.
- While the Metrorail Loop would improve operations and provide a high quality service for the Metrorail Red Line, these advantages do not apply to the Bi-County Transitway corridor as a whole. Implementation of the Metrorail Loop would not address the issues of system connectivity, mobility and accessibility, and efficiency for the entire corridor that are central to the Bi-County Transitway Purpose and Need.

### **Purpose and Need**

Three of the key goals of the Purpose and Need for the Bi-County Transitway are to:

- Increase mobility and enhance accessibility
- Improve transit operations efficiencies
- Support economic and community development

The Bi-County Transitway corridor from Bethesda to New Carrollton contains key activity and employment centers, and is served by a number of transit routes. However, the corridor lacks a convenient, end-to-end east-west rapid transit service. As stated in the Purpose and Need, the Bi-County Transitway corridor needs improved system connectivity and additional capacity to serve east-west travel patterns and to support economic development. The Metrorail Loop does not meet these major goals of the Bi-County Transitway Purpose and Need, as explained below:

- Passengers traveling between the Metrorail Loop and destinations east of Silver Spring would be required to transfer from the Metrorail Loop to light rail transit (LRT) or bus rapid transit (BRT) to complete their trip either to Takoma Park/Langley Park, College Park or New Carrollton.
- The Metrorail Loop would not provide continuous service between Bethesda and New Carrollton. It will not address the issues of an inadequate and slow-moving transportation network for east-west travel between Bethesda and New Carrollton.
- The Metrorail Loop would not allow for the enhanced level of transit connectivity, efficiency, and convenience for the corridor as a whole, since it would introduce a different mode to one segment of the corridor that is not being considered for the other segments of the corridor.
- The Metrorail Loop would not support economic and community development to the same level as the LRT and BRT alternatives. The Metrorail Loop would provide limited

development opportunities west of Silver Spring (no stations at the Chevy Chase, Lyttonsville and Woodside communities).

- The Metrorail Loop proposal would be a less cost-effective solution to addressing the transportation problems and needs associated with the Bi-County Transitway corridor, as compared to a BRT or LRT alternative for the entire 14-mile corridor.
- LRT and BRT options can offer many of the benefits of heavy rail transit (Metrorail) but with more flexibility in design and for less capital cost.

### **Engineering and Environmental Issues**

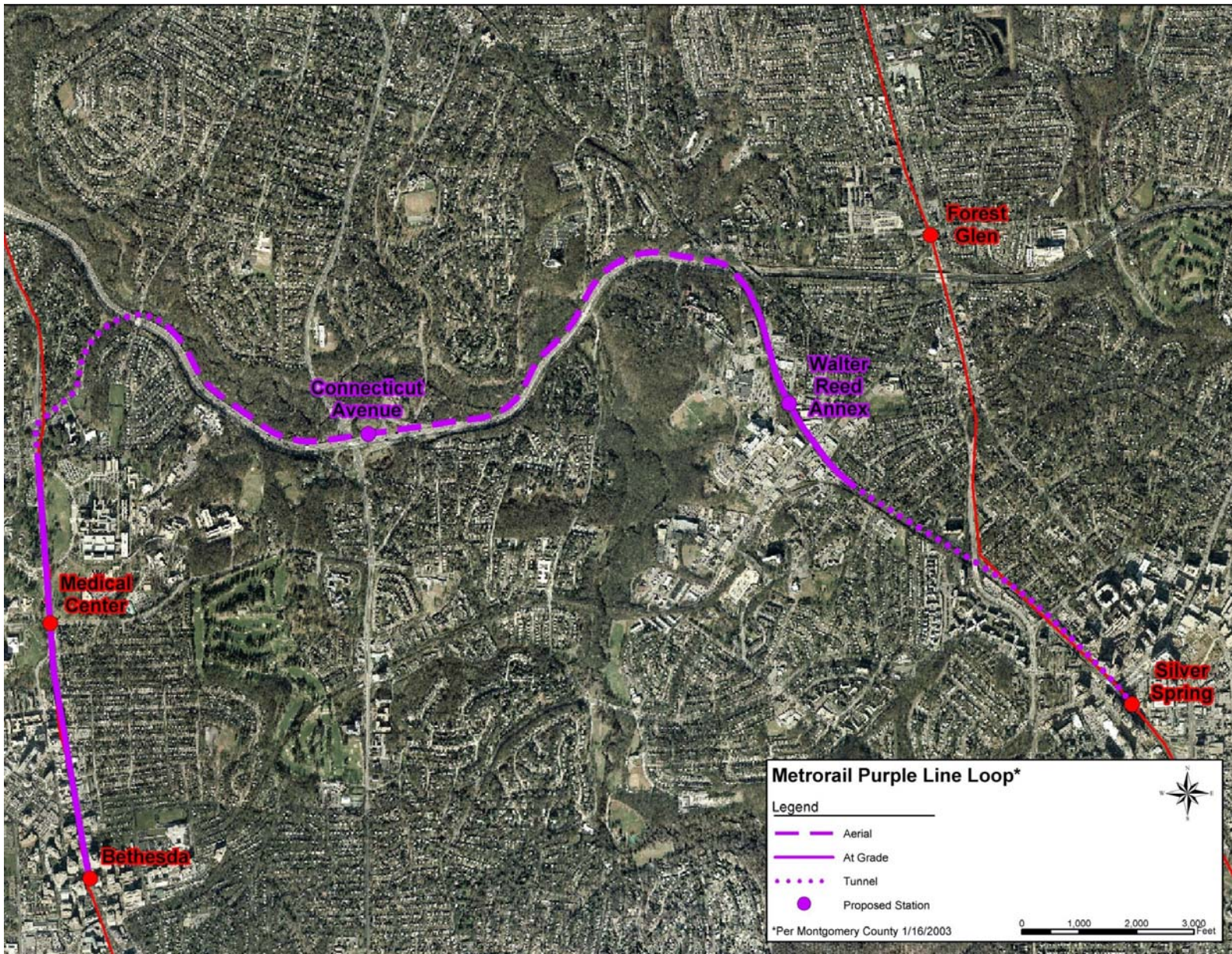
Other issues associated with the Metrorail Loop that MTA has concerns with include:

- The construction of the Metrorail Loop along the north side of the Capital Beltway would require additional right-of-way in Rock Creek Park. The need to acquire additional parkland would involve serious environmental issues, particularly under Section 4(f) where impacts to publicly owned public parks are not permitted where there exists a feasible and prudent alternative.
- The Metrorail Loop proposal does not account for the Capital Beltway widening for Express Toll Lanes that are currently being considered by the State. If such lanes were implemented, the capital cost and Section 4(f) impacts of the Metrorail Loop would likely be significantly increased.
- The Metrorail Loop may lead to a reduced service/capacity level on the heavily used west leg of the Metrorail Red Line north of NIH and Shady Grove due to trains being diverted to a Bethesda to Silver Spring loop. This concern is especially significant since the Red Line's west leg serves the I-270 Corridor which is expected to experience continued high growth and increased demand, particularly if any of the proposed Corridor Cities transit service improvements currently under consideration are implemented.
- The Metrorail Loop doubles the length of right-of-way that would require coordination/negotiation with CSX. The right-of-way within this corridor is very narrow, and therefore, has both community and railroad operational impacts associated with it. The Metrorail Loop proposal assumes that the existing offset in the CSX corridor of 18 feet between track centerlines would continue to be applied. However, CSX has stated that their current offset requirement of 25 feet from the track centerline to the face of a crash wall would now apply to future Metrorail, LRT or BRT line. As a result, it appears that the Metrorail Loop would impact a total of 25 residential properties, 1 commercial property and the Federal Walter Reed Annex Complex that are located along the CSX right-of-way (compared to 4 residential properties for the master plan alignment).

### **RECOMMENDATION**

The Metrorail Loop option does not effectively address the Bi-County Transitway Purpose and Need and has very high capital costs, compared to the BRT and LRT alternatives under consideration. Therefore, it is recommended that this proposed option be dropped from further study as part of the Definition of Alternatives.











## **Appendix B**

### **M-NCPPC Purple Line Loop Memorandum**





**Revised 1-31-03****MEMORANDUM**

**TO:** Montgomery County Planning Board

**VIA:** Charles R. Loehr, Director  
Department of Park and Planning

**FROM:** County-wide Planning Division

**SUBJECT:** Review of Proposal by County Executive for Metrorail Purple Line Loop  
from Silver Spring to Medical Center Metrorail Stations

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**RECOMMENDATION**

Based on staff analysis of the information available concerning the Purple Line Loop (PLL) proposal, staff recommends that the proposal not be carried forward for further detailed study. This conclusion was arrived at based on the findings shown below, with considerable weight given toward the need to move an approvable project ahead in the project planning process. We find the Inner Purple Line (IPL) is the project that should be advanced.

These recommendations are based on technical data and staff research on the planning and implementation process for Federally-funded projects. The findings regarding a two-year or four-year delay for incorporation of the PLL into the current Purple Line study process are estimates but reflect known procedural time frames. Not having heard the community comments that will be presented at the Board hearing, staff has not attempted to evaluate the community acceptance of the PLL proposal.

In developing our recommendation not to study the Executive's Metrorail proposal further, staff is aware of the lack of Montgomery County political consensus on constructing the Inner Purple Line. Our recommendations are made on the basis of technical thought processes. We leave for others to determine what is necessary to overcome that lack of consensus.

**The following sections are found in this memorandum:**

- I. Findings of Analysis
- II. Purpose and Background
- III. Description of Purple Line Loop
- IV. Inner Purple Line
- V. Purple Line Loop Performance
- VI. Evaluation and Comparison of Purple Line Loop and Inner Purple Line

## **I. FINDINGS OF ANALYSIS**

### **Staff finds three distinct advantages to the Purple Line Loop proposal:**

- It addresses several known problems with the Inner Purple Line, such as adverse impacts to adjacent property owners, a degraded trail experience, and space constraints associated with adding tracks in the Silver Spring CBD.
- The PLL attracts more new riders than the IPL because it reduces transfers in the Metrorail system and is a faster ride between Silver Spring and Bethesda than the proposed Inner Purple Line light rail.
- The PLL would improve Metrorail operations flexibility and efficiency. Switches and tunnels would allow for several operating configurations between Shady Grove and Glenmont by connecting the Medical Center and Silver Spring Metrorail stations. It also provides redundancy in the Metrorail system that is not now available.

### **However, the Purple Line Loop raises several grave concerns as well:**

- To continue study on the PLL, bringing it to the point where fully-informed decisions can be made about cost, environmental impacts, and all the other needed aspects that go into a Draft Environmental Impact Statement, is likely to take at least two years and possibly longer.
- The PLL costs approximately twice as much as the IPL. Costs of the PLL are very preliminary and would be subject to significant modification due to the very sketch-level nature of the planning to this point. WMATA staff's cost estimate is \$616 million. Staff finds that this should be at least \$746 million. This estimate is shown in detail in this memorandum. The IPL cost estimate is \$371 million. The increase in project cost for the PLL is greater than the proportional increase in ridership.
- The cost effectiveness of the PLL, based on Park and Planning staff estimates of capital costs, is lower than that of the IPL.
- Some assumptions of the design are critical and, if they must be changed, additional problems could arise. The center-to-center offset between the PLL trains and CSX trains is 18 feet in the designs, although recent designs for the IPL have had to use 25 feet based on CSX guidance. WMATA feels their agreement with CSX allows the lower number.
- The completion of the Capital Crescent Trail will be necessary as a separate project with the PLL, and will have some cost associated with it that has not been determined. Completing the trail is included in the costs for the IPL. Similarly, no new south entrance to the Bethesda Metrorail station would be created with the PLL, eliminating one of the benefits of the IPL design.

- Environmental issues can play a major role in the ability of this project to be approved for Federal funding. The PLL impacts substantially more wetlands, floodplains, and forest than the IPL.
- Community impacts such as visual effects, potential noise, vibration, and other aspects have not been well defined due to time constraints and the sketch-level nature of the planning. These impacts will be somewhat dependent upon the types of structure used to support the Metrorail tracks, their heights, and other variables.
- It does not seem that there are appropriate Metrorail station locations on the proposed alignment between Medical Center and Silver Spring, with the possible exception of the Seminary Road/Linden Lane area near the CSX tracks. However, a station there would require significant changes to the land use and adjacent roadway network to be cost-effective.
- The PLL will reduce the future available Metrorail service capacity for stations north of the Medical Center and Silver Spring stations, perpetuating the need for “turn back” service.

**Finally, two findings do not affect the relative value of PLL and IPL:**

- PLL is feasible to construct from an engineering perspective using the WMATA staff assumptions. The design uses some unusual structures, but there is public land or land from CSX that would allow for construction, and there are no physical constraints that could not be overcome. The DEIS has already resulted in the same finding for the IPL.
- A future rail extension from Silver Spring to Langley Park, College Park and New Carrollton could be constructed with connections to either a Metrorail loop or the Inner Purple Line light rail. There are costs and benefits associated with all combinations of light rail and Metrorail for the sections east and west of Silver Spring.

## **II. PURPOSE AND BACKGROUND**

In mid-January 2003, County Executive Duncan sent to the Montgomery County Council a proposal to link the two sides of the Metrorail Red Line. This link would allow Metrorail trains to travel directly between the Medical Center and Silver Spring stations, creating a loop as well as extension possibilities. Council President Michael Subin sent this proposal to the Planning Board, asking for their review and recommendations to the Council by January 31.

**In this paper, the County Executive's proposal is referred to as the Purple Line Loop (PLL) to differentiate it from the Inner Purple Line (IPL). The proposed Inner Purple Line is light rail that would run from the Bethesda Metrorail station via the Georgetown Branch right-of-way to Silver Spring. A continuation being studied from Silver Spring to Langley Park, College Park and to the New Carrollton Metrorail station is described in this memo as the Inner Purple Line East.**

**The basic question being asked of the staff and Board is:**

- Is this new Purple Line Loop feasible enough to recommend that Maryland DOT and Montgomery County spend time and money on further detailed study?**
- How does this new proposal compare against the Inner Purple Line?**

For this analysis, most comparisons are done against the transit lines between Bethesda or Medical Center, and Silver Spring. This is the section where most detailed information is available about the two lines and where they are most comparable. Each could be linked to a line that would extend east of Silver Spring; ridership and other benefits, as well as costs, are shown in this paper. However, the planning for the eastern section is of a very sketch-level nature at this time.

The need to complete the decision-making about further study for this project is closely related to the time schedule of the Federal Surface Transportation bill reauthorization. U.S Congress House members must have their projects to the House Transportation and Infrastructure Committee by February 28, 2003. The Board was briefed on the Federal reauthorization process recently, and a summary of relevant information is included as an attachment to this memorandum.

### **Status of Related Projects**

Several other projects related to the PLL proposal are in varying stages of study:

- The Inner Purple Line for its entire length from Bethesda to New Carrollton is in an initial Project Planning stage by the Maryland Transit Administration (MTA). The section from Silver Spring to New Carrollton is in a very early stage of analysis, with an alignment still to be determined. However, the western section, from Silver Spring to Bethesda, is well along in a

Supplemental Draft Environmental Impact Statement (SDEIS). A draft EIS was published in 1996 on this section. The SDEIS was initiated in 2001, identifying the impacts of double-tracking the section and updating other information. The SDEIS and Final EIS are expected to be completed in 2003.

- The Corridor Cities Transitway is a planned transitway from the Shady Grove Metrorail station, north to Clarksburg. This line is being evaluated as either a busway or light rail. A Draft Environmental Impact Statement was published in the spring of 2002, and is in the review process now. A decision on mode and other design alternatives is expected in fall of 2003, with a final EIS in 2004. That would allow for final design to begin.
- SHA is studying the addition of HOV lanes to the Capital Beltway from the American Legion Bridge to the Woodrow Wilson Bridge. This concept, developed in the same inter-modal corridor study that identified the "P6" rail alignment for IPL and IPL East, will be documented in a Draft Environmental Impact Statement likely to be completed during 2004. The concept is supported in the Planning Board's Transportation Policy Report and a Public Hearing Draft of a Master Plan amendment was released in January 2003 that would add the portion west of I-270 to the Master Plan of Highways. Due to anticipated environmental and community impacts between I-270 and the Prince George's County line, the County Council has decided to await further information from the SHA study before proposing an HOV lane addition to I-495 east of I-270 in the Master Plan of Highways.



### III. DESCRIPTION OF PURPLE LINE LOOP

#### Operating Methods and Headways

The 4.7-mile<sup>1</sup> PLL would connect the Silver Spring and Medical Center stations on the Red Line using heavy rail cars like those found throughout the rest of the Metrorail system. The PLL would operate initially with a peak hour headway of 6 minutes (10 six-car trains per hour) and could operate with a peak hour headway of 5 minutes (12 eight-car trains per hour)<sup>2</sup> during the year 2025 without acquiring any additional rail cars beyond those WMATA is already planning to purchase in order to meet their year 2025 service goals. The PLL would operate as a true loop, such that Red Line trains that currently terminate at the Grosvenor and Silver Spring stations would instead continue clockwise along the loop from Medical Center and counterclockwise along the loop from Silver Spring.

#### Physical Alignment

**The section numbers indicated in the description of the physical alignment refer to the section illustrations located in the 11" x 17" color overview map.** All section illustrations are looking to either the south or east. The sections were provided by WMATA staff.

***Silver Spring Station to 16<sup>th</sup> Street (MD 390): Section 1-1:*** In the area between the Silver Spring station and 16<sup>th</sup> Street, the outbound and inbound PLL tracks are separated to provide a more economical engineering solution. From the existing Silver Spring station, the area currently occupied by the pocket/turnaround tracks just north of the station would be converted into a 1000-foot-long retained cut<sup>3</sup> for single track. Beyond the existing station, the outbound (toward Medical Center) track would descend below the grade of the CSX tracks and main Red Line, into the retained cut and then into a 400-foot-long cut-and-cover tunnel to pass underneath the CSX tracks and Spring Street before entering a 1200-foot section of mined tunnel to pass back underneath the Red Line and an 800-foot-long cut-and-cover tunnel to pass underneath 16<sup>th</sup> Street. The track would emerge on the east side of the CSX tracks northwest of 16<sup>th</sup> Street, and would be on top of the stacked box configuration shown in Section 2-2.

Beginning northwest of 16<sup>th</sup> Street, the inbound tracks (toward Silver Spring) are shown at the bottom of the stacked box configuration in Section 2-2. The inbound tracks would remain below grade and break into the existing Red Line tunnel beneath 16<sup>th</sup> Street, where they would join up with the existing track and proceed along the remainder of the current Red Line route to Silver Spring.

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<sup>1</sup> Length of new construction

<sup>2</sup> The maximum headway for the PLL is 4.6 minutes (13 trains/hour), but has been rounded to the nearest whole number.

<sup>3</sup> A retained cut is basically a cut and cover tunnel without the cover. Sections of the Red Line between Grosvenor and Rockville are in a retained cut.

**16<sup>th</sup> Street to south of Talbot Street: Section 2-2:** After emerging from the portals near 16<sup>th</sup> Street, the line proceeds in a retained cut on the east side of the CSX tracks in a stacked box configuration, outbound tracks on top, inbound tracks on the bottom.

**Transition From South of Talbot Street to North of Talbot Street: Section 3-3:** The line transitions from the stacked box configuration to a more typical side-by-side double track alignment and passes under the Talbot Street bridge over CSX on the east side of the CSX tracks. Some work would have to be performed on the Talbot Street bridge to accommodate the additional train tracks.

**North of Talbot Street to Tunnel Under CSX Tracks: Section 4-4:** North of Talbot Street, the line continues in the standard double-track configuration on the east side of the CSX tracks. The total length of the at-grade and retained cut section from the 16<sup>th</sup> Street tunnel exit to north of Talbot Street is 1900 feet.

**Tunnel Under CSX Tracks: Section 4A-4A:** The line then descends to a 1100-foot-long mined tunnel under the CSX tracks, emerging on the west side of the CSX tracks just south of Brookville Road. The line passes under the Brookville Road bridge over CSX on the west side of the existing tracks. Some work would have to be performed on the highway bridge to accommodate the additional train tracks.

**North of Brookville Road to Beltway Crossing: Section 5-5:** After passing under the Brookville Road bridge, the line proceeds 1100 feet either at-grade or in a retained cut in a side-by-side double track configuration on the west side of the CSX tracks to the site of the proposed Walter Reed Annex station, southwest of Montgomery Street. Departing the station site, the line continues for 1500 feet either at-grade or in a retained cut on the west side of the CSX tracks before crossing the Capital Beltway (I-495) on a new bridge parallel to the existing bridges for the CSX tracks and Seminary Road. Immediately following the bridge, the line turns west and continues on an aerial structure, passing over Linden Lane before descending to roughly the same grade as the Beltway itself and continuing on the north side of the Beltway. The total length of the bridge over the Beltway and subsequent aerial structure is 2000 feet.

**North of Capital Beltway to Rock Creek Crossing: Section G-G and Typical Cross Section** (on bottom left of map): While traveling for a distance of 1000 feet at roughly the same grade as the Beltway or slightly higher in this section, the line is shown on WMATA maps as at-grade.

**Rock Creek Crossing to West of Connecticut Avenue (MD 185): Section F-F and Section E-E:** The line would cross Rock Creek on a 600 foot-long single-column structure supporting double-track on top, northwest of and parallel to the Beltway crossing of Rock Creek. The line would then return to the at-grade alignment shown in section G-G for a distance of 2500 feet before ascending to an aerial structure and the proposed station in the northwest quadrant of the Beltway interchange with Connecticut Avenue (MD 185). This station would be an aerial station on a bridge long enough to pass over the interchange ramps as well as Connecticut Avenue itself. Section E-E shows the aerial structure on either side of the proposed Connecticut Avenue station. The total length of this aerial structure is 3300 feet.

***Descent to Western Tunnel: Section D-D:*** After leaving the aerial section west of Connecticut Avenue, the line descends into a 1050-foot-long retained cut and enters a 1500-foot-long cut-and-cover tunnel parallel to the Beltway, on the north side just east of Cedar Lane.

***Mined Tunnel Under Beltway to Medical Center Station: Section C-C:*** From the cut and cover on the north side of the Beltway, the line enters a mined tunnel that passes underneath the Beltway and turns to the southwest. The mined tunnel continues underneath the public right-of-way for Elmhurst Parkway and beneath parkland owned by the Commission before moving underneath the right-of-way for Cedar Lane. The line would then pass through an underground junction to join with the main branch of the Red Line north of the Medical Center station and continue into the station itself, which is approximately 85 feet underground. The total length of new mined tunnel is 3800 feet.

## **Potential Stations**

***Walter Reed Annex,*** located on the west side of the CSX tracks southwest of Montgomery Street. This station would be at-grade and adjacent to property owned by the U.S. Army. Currently, both walk and auto access to this site is only from the west, with the auto access via either Linden Lane or Brookville Road and then through the Walter Reed Annex.

***Connecticut Avenue (MD 185) and the Capital Beltway (I-495),*** located in the northeast quadrant of the interchange (the area bounded by the on-ramp from northbound Connecticut Avenue to the westbound Beltway/Outer Loop). This station would be on an aerial structure. Auto and bus access to the station and an adjacent parking structure would be via the interchange ramps.

## **Cost Estimates**

WMATA has estimated the capital cost of the PLL as described above at \$616 million. Eliminating either of the two new stations would reduce the overall capital cost.

Operating costs depend primarily on the frequency of service along the PLL. Initial operation of the PLL at 6-minute headways (10 six-car trains per hour) would increase Metrorail annual operating costs by approximately \$10 million for the increase in vehicle-hours of operation but would not require capital expenditure for new railcars. Year 2025 operation of the PLL at 5-minute headways (12 eight-car trains per hour) would increase annual operating costs by \$10 million over base Red Line operations for the year 2025, again for the increase in vehicle-hours.

## **Future System Expansion**

There are three potential system expansion points for the PLL. The first is from Silver Spring east to Takoma Park, Langley Park, College Park, and New Carrollton, generally following the route of the IPL. This extension could be done with either light rail or heavy rail. The second and third potential expansion points would branch off the PLL on the

north side of the Beltway. On the west side, the line would branch off prior to the Cedar Lane portal and continue on the north side of the Beltway to Rock Spring Park (via Grosvenor or a new transfer station at Pooks Hill Road), Montgomery Mall, and ultimately Tysons Corner in Virginia. On the east side, the line would branch off prior to the Linden Lane bridge crossing the Beltway and continue on the north side to Four Corners (via Forest Glen), White Oak/FDA, and then turn down New Hampshire Avenue (MD 650) to Langley Park, where it would join the IPL alignment to College Park and New Carrollton. Both of these lines would almost certainly have to be operated as heavy rail. No detailed engineering has been performed on any of the three potential expansions.

### **Surrounding/Adjacent Land Uses at Proposed PLL Stations**

An analysis of job and household data for a half-mile radius around each new station on the Purple Line Loop yielded the following results<sup>4</sup>:

In 2025, the Connecticut Avenue/I-495 station is projected to serve approximately 620 single-family households, no multi-family households, and about 795 jobs. The Walter Reed Annex station is projected to serve about 445 single-family households, 615 multi-family households, and 2,990 jobs. These are roughly the same as current conditions, as little new development is planned for these two areas under current plans.

### **Tunnel/Rock Conditions**

Although detailed geotechnical and feasibility studies will be needed in siting and designing the tunnels of the PLL, an initial examination of the information available from published maps indicates no obvious problem with tunneling through the rocks along the proposed tunnel alignments. Indeed, these same formations have already been tunneled through for Metro in other locations in Montgomery County. However, specific locations of important features, such as depth to bedrock, formation contacts, and the Rock Creek Shear Zone, are subject to mapping resolution limitations and error, and if of geotechnical concern, would have to be assessed and/or verified in the field.

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<sup>4</sup> Data rounded to the nearest 5 jobs and households.

## **IV. Inner Purple Line**

The term Inner Purple Line (IPL) generally refers to a rail transit corridor connecting the Bethesda, Silver Spring, and New Carrollton Metrorail stations. The western portion of this corridor, primarily referred to as the Georgetown Branch, is a 4.4-mile master-planned transitway between Bethesda and Silver Spring along historic freight rail alignments. This section has a long and detailed planning history. It is summarized in Attachment 2 of this report. In the following text, the terminology will be:

- “IPL” refers to the Inner Purple Line between Bethesda and Silver Spring, the Georgetown Branch section.
- “IPL East” refers to the Inner Purple Line between Silver Spring and New Carrollton

### **Inner Purple Line Description**

The current design being evaluated for the IPL between Silver Spring and Bethesda includes the following features:

- A double-track light-rail system, except for a portion of single-track adjacent to the Metro Plaza Building northwest of Colesville Road in Silver Spring
- A continuous trail adjacent to the light-rail line, except for a section approximately 1500 feet in length near the CSX Metropolitan Branch junction where the trail follows residential streets in the Rosemary Hills community
- Stations at Bethesda (Metrorail Station), Chevy Chase Lake (Connecticut Avenue), West Silver Spring (Lyttonsville Place), Woodside (16<sup>th</sup> Street), and Silver Spring (Transit Center).

### **Inner Purple Line Performance and Impacts from DEIS**

The 1996 Draft Environmental Impact Statement for the IPL (Georgetown Branch Transit/Trail) concluded that the primarily single-track light-rail/trail alternative would:

- Carry approximately 19,500 daily riders
- Save travelers 427,400 hours annually
- Have a capital cost of approximately \$205M and a cost-effectiveness per new rider of \$23.29.

Park and Planning staff have conducted a separate analysis using their forecasting methodology to provide a comparison with the Purple Line Loop. The figures used are somewhat different than those from the DEIS due to different methodologies and future

land use assumptions (this analysis uses a year 2025 jobs-and-household forecast, for example, while the DEIS used 2020).

The current capital cost estimate for the IPL is \$371M, substantially higher than the 1996 DEIS estimate of \$205M. The reasons for the increase are:

- \$45M for escalation from 1995 dollars to 2003 dollars
- \$100M associated with both the need to double-track the system to incorporate future operating plans for the IPL East extension and to increase the separation from CSX rails from the 18 feet acceptable to CSX in 1996 to the 25 feet now required by CSX
- \$21M for locally preferred options described in the DEIS, including an overpass at Connecticut Avenue and underpass at the CSX Metropolitan Branch junction, and trail extensions through the Bethesda and Silver Spring stations



## V. PURPLE LINE LOOP PERFORMANCE

### Transportation and Mobility Impacts

This section presents the transportation and mobility impacts of the Purple Line Loop. Specifically, this analysis looked at network connectivity, travel demand for the new line including ridership by station, travel time savings, and access to stations. Section 6 compares the results of the PLL with the Inner Purple Line.

#### 1. Demand Forecasting Methodology

The analysis of transportation and mobility impacts performed for this study is based on travel forecasts performed using the M-NCPPC TRAVEL/2 demand model. This analysis used MWCOG Round 6.2 cooperative land-use forecasts for the year 2025 as the primary input to project travel demand. TRAVEL/2 is a regional travel model encompassing the greater Washington-Baltimore region, but with greater network detail within Montgomery County. Travel forecasts from the model are for the three-hour evening peak period.

It should be noted that the level of analysis performed for this study can best be described as sketch-level planning, given the limited time available for study. Travel forecasts developed to support Major Investment Studies in the corridor, such as the Georgetown Branch DEIS and the Capital Beltway Corridor Study, should be more reliable. However, TRAVEL/2 allows for a relative comparison of the Purple Line alternatives using the same methodology.

A summary of key project assumptions is shown in Table 1.

**Table 1: Travel Model Assumptions**

Input	Assumption
Land Use	MWCOG Round 6.2 Cooperative Forecasts (2025)
Base Highway and Transit Network	2025 Regional Constrained Long-Range Plan network (without Georgetown Branch)
Headways*	Metrorail (PLL): 5 minutes Light Rail (IPL): 6 minutes
Average Transit Speeds, including station stops	Metrorail: 37 mph Light Rail: 29 mph
Station Parking	Unconstrained (no parking charge)
Fare Structure	No Change from Base – assumes average Metro fare based on distance
Drive Access	Uses TRAVEL/2 coding convention, drive access allowed at all new stops
Bus Service in the Corridor	CLRP network assumes 10 minutes headways for bus routes serving the Silver Spring transit center. J2 Bus headway increased to 20 minutes for the PLL and IPL forecasts.
* The one-minute difference in headways between IPL and PLL has a negligible effect on travel demand forecasts.	

## 2. Travel Patterns in the Corridor

Travel forecasts for the proposed Purple Line Loop provide an indication of the success of the line in terms of increasing transit ridership in the corridor, providing mobility benefits for new and existing transit riders, and supporting the economic viability of the communities connected by the transit line.

Future travel conditions are a function of both the underlying land use patterns and assumptions about the transportation network. According to the Round 6.2 forecasts, both population and employment are expected to increase for the area of Montgomery County inside of the Beltway. Between 2000 and 2025, employment is forecasted to increase by 17.5% and households are expected to increase by 15.3%. Information from the 1997 Census Update Survey reveals that 18.4% of Montgomery County residents work inside the Beltway, a total of about 85,000 workers.

The PLL would provide a critical link between the two legs of the Metrorail Red Line. As a result, it would serve both local and regional transit trips. Many of the riders would be expected to have at least one trip end within the portion of Montgomery County within the Beltway, but there would also be a number of potential through trips on the line – riders that begin and end their trips outside of the corridor.

## 3. Travel Time Savings

The PLL would average a speed of 37 miles per hour over 5.3 miles between Medical Center and Silver Spring for a total time of 8.6 minutes. Removing the Connecticut Avenue station would increase the average speed slightly to 39.3 miles per hour, decreasing the line time to 8.1 minutes. The current Metrorail time between Bethesda and Silver Spring is 35 minutes; the J2 bus travels between the two centers in 18 minutes.

Table 2 presents travel times for some typical origin-destination pairs for the Baseline and PLL scenarios. Travel times assume a walk connection to transit and include in-vehicle, walk, wait, and boarding times.

**Table 2: Transit Times (in minutes) Between Selected Origin-Destination Pairs**

Origin-Destination Pair	Base	With PLL
Bethesda to Silver Spring	34	17
Friendship Heights to Wheaton	41	33
Rockville to Takoma Park	50	40
Dupont Circle to Connecticut Ave (new station)	53	30

One measure of the benefits of the new line is the travel-time savings for transit riders. For transit trips that have a time savings with the PLL, the average time saved (as compared with the 2025 Baseline scenario) is 5.7 minutes. This amounts to a total time

savings of 3,200 hours daily or 952,200 hours annually. For the PLL without the Connecticut Avenue station, time savings would be 3,030 hours daily or 900,200 hours annually.

#### 4. Impact on Mode Shares

By improving transit service in the corridor, the PLL would attract some new work trips to transit causing a slight increase in the mode share for these trips. A number of factors affect mode share, including in-vehicle travel time, waiting time, walking time, auto availability, and characteristics of the station area such as density and walkability.

Table 3 shows transit mode shares for the Baseline and PLL scenarios. The PLL increases transit shares more in the Silver Spring policy area than for the county as a whole. This policy area includes the Lyttonsville/Walter Reed annex areas. Transit shares are projected to be greater for the home end of the trip, with the PLL increasing the share from 19.3% to 20.6% of work trips. Larger shifts in mode shares in this part of the county are difficult because there is already significant transit usage.

**Table 3: Transit Mode Share for Work Trips**

Area	Baseline		With PLL	
	Work End	Home End	Work End	Home End
Montgomery County	9.2%	14.1%	9.4%	14.4%
Policy Areas:				
Bethesda	18.0%	18.5%	18.8%	19.0%
Silver Spring	15.3%	19.3%	16.0%	20.6%

The mode shares shown above suggest that the PLL will primarily serve existing transit riders who are already using bus or rail service. The line may show a larger increase in boardings than in person-trips using transit. The person-trips are called “linked” trips because all of the segments of a transit trips are linked together. Boardings are referred to as “unlinked” trips. For example, a transit passenger who takes a bus to the PLL in Silver Spring, transfers to the Red Line in the direction of Shady Grove, and then walks to a job in Rockville would have three transit boardings (1 on bus, 2 on rail), but only one linked trip. On a regional basis, when compared with the Baseline scenario, the PLL alternative would increase linked transit trips by 1100 in the evening peak period, or 3850 daily trips. If the Connecticut Avenue station were not included in the PLL, there would be fewer new transit trips, about 1060 in the evening peak period, or 3725 daily trips.

#### 5. Projected Ridership on the Purple Line Loop

Table 4 shows the projected evening peak-period ridership for the PLL, with and without the Connecticut Avenue station. The PLL would carry 9,700 evening peak-period passengers with the Connecticut Avenue station and 8,470 passengers without the Connecticut Avenue station.

Because the PLL would be operated as a loop, the segment between the Medical Center and Silver Spring does not reflect the entire ridership of the loop. However, riders who exit and board on this segment are counted as ridership for the new segment of the loop. There may be some through trips that are also using the line but are not shown in this table. For example, a trip from Bethesda to Takoma would use the loop, but would not board or exit along the new segment.

Ridership on the entire Red Line including the PLL includes about 1,500 new boardings not accounted for by the 9,700 riders on the new PLL segment. However, there are roughly the same number, about 1,500 boardings, that are transfers from the PLL to the Red Line. These riders are counted as being on both the Red Line (outside of the PLL) and on the PLL.

**Table 4: Evening Peak-Period Ridership for PLL Stations**

	With Conn. Ave Station		Without Conn. Ave Station	
	Exits	Boards	Exits	Boards
Medical Center	1,240	2,700	1,630	2,610
Connecticut Ave	1,830	450	n/a	n/a
Walter Reed	1,480	470	1,720	520
Silver Spring	5,150	3,220	5,120	3,060
Evening Peak	<b>9,700</b>	<b>6,850</b>	<b>8,470</b>	<b>6,190</b>
Daily Riders	<b>34,000</b>		<b>29,700</b>	
Annual Riders	<b>10.10 million</b>		<b>8.82 million</b>	

The evening peak period ridership figures indicate the directionality of trips, with exits representing the home end of trips, and boardings representing the work end of trips in the evening peak period. The transit volumes by segment show a directional imbalance, with heavier flows from west to east. The maximum load point would be just east of Medical Center, with transit volumes of about 6900 eastbound and 2600 westbound.

Projections of daily and annual ridership have been developed by factoring evening peak-period totals. The peak-to-daily factor is a key assumption that affects the daily and annual evaluation measures. There is a range of values for existing Metro stations to convert evening peak period to daily trips, depending on the level of mid-day and non-work trips. The system average is about 3.0, but values can range from 2.6 for New Carrollton to 3.8 for Dupont Circle. To be consistent with the Georgetown Branch DEIS, a peak-to-daily factor of 3.5 was used in this study. A daily-to-annual factor of 297 was also used to generate annual trip estimates.

If the PLL were extended from Silver Spring to New Carrollton, ridership would significantly increase. Evening peak period riders on the entire line from Medical Center to New Carrollton are projected to be 20,500, or about 72,000 daily trips. The Medical

Center to Silver Spring segment would increase from 9,700 to 11,300 evening peak period riders with the line extended to New Carrollton.

## 6. Access and Egress Modes

The access and egress modes of passengers boarding and alighting at the new stations on the PLL were analyzed as a transportation impact. The travel forecasts conducted for this study assumed that there would be unconstrained parking for “park & ride” trips. Other riders would arrive at the stations as auto passengers, or “kiss & ride”. The forecasts indicate that if drive-access facilities were available, the Connecticut Avenue station would be primarily accessed by automobile, at 67% of the trips. Walk and bus access are expected to have about equal shares of the riders. Walk access to a Connecticut Avenue station would depend on proper facilities for pedestrians. Some existing Metrorail stations that are suburban and isolated in nature do attract walk-access trips. For example, Greenbelt (9.5%), Dunn Loring (12%), and Twinbrook (17%) do not have high residential densities near the station. Bus transfers at the Connecticut Avenue station would depend on routing existing L7 and L8 Connecticut Avenue buses with a direct connection to the new station.

The proposed Walter Reed station would have lower percentages of drive-access trips. The station would have a majority of trips accessing the station by walking. Bus access to the area would be minimal, currently served only by the Ride-On Route 4.

**Table 5: 2025 Evening Peak Period Access/Egress Modes for New Stations**

STATION	Access/Egress Modes		
	Drive	Walk	Bus Transfer
Connecticut Ave	67%	19%	14%
Walter Reed	43%	54%	4%

## 7. Highway Traffic Impact

The PLL would have a minimal impact on vehicle miles traveled (VMT). Countywide, the PLL does not change VMT compared with the Baseline scenario. For the section of the county inside the beltway, the PLL reduces VMT by less than 0.1%. There is a very slight 0.2% increase in VMT in the Kensington/Wheaton area, probably as a result of the new park-and-ride trips. Traffic volumes on the Capital Beltway do not show any reduction due to the new transit line. There would likely be local traffic impacts around new stations due to transit riders arriving by automobile.

## Purple Line Loop Natural Environmental Impacts

Any transportation facility requiring Federal funds must go through an environmental impact statement. M-NCPPC has a Geographic Information System (GIS) that has information for a number of elements considered as sensitive areas. This is not intended to replace the millions of dollars that will ultimately have to go into detailed studies, but it does provide a preview of areas that may require avoidance, minimization, or mitigation. For the purposes of consistency, the data to create the chart below come from GIS. The chart did not use data from the draft EIS for the Georgetown Branch Trolley. **A map showing critical environmental features is attached to this memorandum.**

The best thinking on the proposed Purple Line Loop is that after following the CSX right-of-way to I-495, it will generally be on the north side of the existing edge of paving but still within SHA's easement for I-495. Staff looked at an area 50 feet from the edge of paving. **Actual impacts would be substantially reduced if the line were supported on piers above the grade of I-495.**

Overall, the PLL will have much greater impacts on the natural environment than the IPL. Its alignment adjacent to Rock Creek Park means it will, by its nature, produce negative effects that will be difficult to avoid.

There are several cautions about the following information. This is a planning level analysis and is based on many simplifying assumptions and should be used as a preliminary screening method. The results are less precise than would be determined from individual project engineering studies and extensive environmental fieldwork. Limitations include the following:

- The locations and extent impact were determined by a 50-foot right-of-way. Areas of disturbance could change significantly as the design process reduces impacts through relocation and design and construction methods.
- Steep slopes are generally not accounted for.
- The right-of-way does not capture project components such as storm water management facilities and staging areas, which create additional areas of disturbance.
- The extent of the environmental features is often more extensive than the indicators available in the GIS. Therefore this tool should be used to compare alignments rather to evaluate a single alignment.

These limitations are acceptable for a planning level review, because the measurements are primarily to be used in relative terms rather than as absolutes. They are a useful composite indicator of relative resource disturbance among these alternatives.



**A definition of the terms used in the Environmental Features is in Attachment 3. Note that the PLL assumes 50 feet of disturbance outside the current Beltway pavement. This could be reduced with structures.**

**Table 6: Environmental Features**

<b>Environmental Features (Shown in acres, except as noted)</b>	<b>IPL</b>	<b>PLL</b>
Total Acres of Surface Right-of-Way (not tunnel areas)	27.4	21.5
Wetlands	0.1	2.8
Floodplain	0.9	6.1
Number of Stream Crossings	2	5
Stream Buffers	4.4	7.6
Park Property	0	7.0
Forest	0.9	9.5
Significant Forest (100 acres or more)	0.1	6.3
Interior Forest Habitat (300 feet from edge of forest)	0	5.5
Number of Buildings	2	0
Number of Private Home Lots	0	1
Number of Archeology Sites	6	2
Number of Historic Districts	0	0
Linear Feet of ROW Adjacent to Park Property	1199	6945

### **Community Impacts of the PLL**

A number of area master plans contain references to the Georgetown Branch Trolley/ Trail (now Inner Purple Line western portion), providing guidance to the access, land use, and other features, all supporting this project. Some considered other options. The North and West Silver Spring Master Plan (August 2000) recommends the implementation of the Georgetown Branch Transitway between Silver Spring and Bethesda to reduce demand along East-West Highway. However the Plan also says that “This Master Plan’s proposed land uses and transportation network do not preclude any of the transit modes or alignments which are currently proposed in the CBMIS (The Capital Beltway Major Investment Study).” Transit access to the two major Central Business Districts is not negatively affected by the PLL, so it generally carries out the master plan goals of improving transit use.

Probably the largest change from current plans is in the station locations. The Georgetown Branch Master Plan Amendment specifically recommends a transitway and

trail along the Georgetown Branch alignment between Bethesda and Silver Spring. The plan recommends a light-rail line with up to eight stations total, six of them being neighborhood stations in between the terminal stations in the Bethesda and Silver Spring CBDs. It recommends that there be a minimum of five stations built initially: Bethesda CBD, Connecticut Avenue/Chevy Chase Lake, Lyttonsville, Spring Street and Silver Spring CBD. The Plan also recommends three additional stations for future consideration: East-West Highway, Jones Mill Road and Woodside/16<sup>th</sup> Street. The current Inner Purple Line proposal is consistent with these recommendations and includes five stations. Additional stations could be added in the future.

By comparison, the PLL includes only two new middle stations to serve neighborhoods. However, they are in new locations: the Connecticut Avenue/Chevy Chase Lake station is moved north to Beach Drive where it is no longer near the Chevy Chase Lake commercial neighborhood and is no longer a “walk-to” station. It would become a park and ride station with a parking garage.

The Lyttonsville Road station is moved northeast to the campus of the Walter Reed Army Institute for Research where there are security issues for the campus. There are also access issues for the surrounding neighborhoods due to distance and the fact that access may be limited by Army security. This station would be better located on Linden Lane where the community has access and where it could benefit the reuse of the historic National Park Seminary property. However, the latter site also poses acquisition issues since it is the site of an Army warehouse and salt dome. To date, the Army has not been willing to include the property in the National Park Seminary sale even though it would add significantly to the economic feasibility of restoring and reusing the National Park Seminary site. Without a new site and new warehouse, the Army will likely not be interested in selling or leasing the site.

On the positive side, a station at Linden Lane could increase the land use options and economic feasibility of reuse of the National Park Seminary historic resource.

With the PLL, the 16<sup>th</sup> Street Station is eliminated. In recent Inner Purple Line studies, the 16<sup>th</sup> Street station took the place of the one at Spring Street. The PLL would include neither station.

Several master plans may need to be amended to reflect a substitution of the PLL for the IPL alignment.

The alignment that better provides transit to the local neighborhoods also has the greater potential impact on those neighborhoods in terms of views and noise. The necessary community impact mitigation would therefore be greater for the Inner Purple Line which best serves the local neighborhoods than it would be for the PLL alignment.

The PLL would remove the need for a maintenance yard in the Lyttonsville area. The privately-owned land could be used for other industrial uses consistent with the master plan recommendations for that area. The property owned by M-NCPPC at Lyttonsville Road/Lyttonsville Place could be retained for public use such as trailhead parking for the Capital Crescent Trail.

## **Noise, Vibration and Visual Impacts**

It is likely that the PLL will have some negative effects on homes near the alignment. The use of the CSX and Capital Beltway right-of-way means that no homes are directly adjacent to the alignment. However, depending on the height of the structures and location within the right-of-way, homes in some communities may have negative noise, vibration or visual impacts. Only further detailed study could quantify this topic, and the necessary information is not available at this time.

Many of the communities that could be directly affected already have noise walls designed to mitigate traffic noise generated from vehicles on the road surface and not from a higher level. Therefore, the visibility and proximity of an elevated heavy-rail line would be an issue. The neighborhoods that should be evaluated are:

- Forest Glen Park on the south side of the Beltway, particularly Newcastle Avenue
- Jones Mill Road on the south side of the Beltway, particularly Parkview Road
- Kensington Parkway, particularly Glenmoor Drive on both the north and south sides of the Beltway
- Stoneybrook Road near the Mormon Temple on the north side, particularly Hill Street and Campbell Drive

## **VI. EVALUATION AND COMPARISON OF PURPLE LINE LOOP AND INNER PURPLE LINE**

This section compares the PLL and IPL and describes the pertinent findings summarized in Section I of this memorandum.

### ***Benefits of PLL***

Staff finds three distinct advantages to the PLL proposal that would make it appealing for further study if they were not outweighed by other factors.

#### **1. PLL Addresses Known Concerns with IPL**

Current project planning efforts for the IPL have identified a number of concerns that will be addressed and resolved in the SDEIS and FEIS documentation for the IPL, but would be eliminated if the IPL were functionally replaced by the PLL:

- Issues associated with introduction of the light-rail mode:
  - The yard and shop required along the alignment
  - The short segment of single-track operation at the Metro Plaza Building
  - Need for additional cross-sectional width through the Silver Spring Transit Center
  - Location of tail-tracks at Silver Spring
- Issues associated with the introduction of transit vehicles in the Georgetown Branch right-of-way
  - Mitigation of indirect adverse impacts to adjacent property owners, primarily related to noise/vibration and visual effects
  - Concerns regarding a degraded experience for trail users, particularly in the tunnel under the Apex and Air Rights Buildings in Bethesda
  - Opposition by adjacent property owners, notably the Columbia Country Club

#### **2. PLL Attracts More New Transit Riders**

The PLL is projected to attract more new transit riders than the IPL. There are two primary factors that make the PLL more attractive to transit users:

- Slightly higher speeds than the IPL and average of 37 miles per hour compared with 29 miles per hour.
- A reduced need for transfers compared with the IPL. There are more “one-seat rides” with the PLL because it connects directly with the Red Line. The IPL would have a greater number of trips that would transfer at least once between the Purple Line and the Red Line.

The cost-effectiveness calculations included in this section use both new riders (linked) and total riders (unlinked) trips. Total riders gives an indication of the number of users of the new line but this number includes some riders who could take bus or rail under the Baseline scenario. New riders only included those person trips that shifted from an auto mode to a transit mode.

### 3. PLL Enhances Metrorail Operations Efficiency and Flexibility

There are operating efficiencies in having a Purple Line Loop.

- It would use WMATA's current rolling stock.
- It could start with no additional cars.
- It would not require a new maintenance yard.
- It would provide more options for Metrorail operators to switch trains to different locations in the event of an emergency.
- It would even be possible to bypass downtown and still serve many stations should an emergency require it.
- It would be a "one seat" ride from Silver Spring to Bethesda and all Redline stations to the south.
- In contrast, the **Inner Purple Line** would: add a new technology to the region with all new cars, would require a new maintenance yard, a unique labor force and the development of operating rules for the trolley.

### **Disadvantages Of PLL**

Despite three substantial benefits of PLL described above, staff finds many more concerns with the PLL that form the basis for the recommendation not to introduce the PLL into the current state study process.

#### 1. Federal Study Process Delays

Staff understands from our experience and discussions with MTA that if the PLL is incorporated into the current Purple Line EIS process, it will take approximately two years of data collection, alternatives development, and engineering to bring the PLL to a common level of detail with the IPL. If these efforts result in identifying major environmental issues, the outcome will take much more time and it may be that the Inner Purple Line is the preferred alternative from the perspective of the Federal approval agencies.

#### *FTA Criteria*

The Federal Transit Administration (FTA) evaluates new transit projects making its decisions on those projects, with the selected ones obtaining Full Funding Grant Agreements and thereafter appropriations. Specifically they look at mobility improvements, environmental benefits, operating efficiencies, cost effectiveness and supporting land use. The level of local support, as reflected in funds available, and readiness to implement are also considered.

Perhaps the most heavily-weighted factor is **cost effectiveness**. In general terms, cost effectiveness is the cost of the proposed new start (annualized incremental capital plus annualized operating cost) per unit of benefit. The FTA is changing its definition of “benefit”. In the last authorization process, FTA used new transit trips as its measure of benefit. They are changing that to total “user benefits” which is calculating the time saving by all users of the new project as well as time saved by roadway users from reduced congestion. As this new measure is still somewhat under development, no one can yet perform these calculations. M-NCPPC staff has provided the old measure of cost per new rider, while recognizing that it does not capture the complexity of the pending FTA criteria.

Staff is using our in-house transportation forecasting computer model to make estimates of ridership and user benefit. It has not been specifically calibrated for this area as would be done for an analysis with more time. Staff is confident, however, in the model’s ability to calculate the relative differences of alternate routes. Readers must recognize that the calculation of user benefits will change when the new FTA methodology is available for use. In the absence of the actual user benefit calculation that FTA will use (and not knowing what percentage of the costs will be paid by non-Federal sources for either alignment), staff cannot be certain of each alternative’s relative competitiveness for FTA approval. Staff can only make a quick-response assessment on the basis of the information available.

Certainly, the project with the most benefits per dollar of cost has the higher probability of being recommended by FTA. On the comparison made by M-NCPPC, the IPL is more cost effective. The Purple Line Loop’s increased ridership, due to increased speed, and time saved by travelers over light rail is not enough to overcome the increase in cost as compared to the IPL.

One proxy for **environmental benefits** is new transit riders; the other is changes to total vehicle miles of travel. Both these measure are related to reduced air pollution. The PLL has more new transit riders and reduces vehicle miles of travel more than the IPL.

On the basis of **land use**, the IPL would rate better. There are certainly no differences in land use in either the Silver Spring CBD or Bethesda CBD, which have stations in the same locations under all routes. The difference is between those major centers. The master plans for the areas covering Connecticut Avenue and Lyttonsville anticipate light rail. There would be one less station on the PLL and the relocation of two intermediate stops would be required. The Connecticut Avenue stop would move to an elevated spot above I-495. Transit-oriented development at this location would be highly unlikely. The Purple Line Loop would replace the Lyttonsville stop to a location along the CSX tracks south of Linden Lane. There would have to be significant zoning changes in the area to take advantage to the accessibility that Metrorail would bring. How much acceptance or resistance there would be for such changes is unknown. The light rail alignment also had a stop at 16<sup>th</sup> Street to support the existing residential

high rises nearby, with the possibility of a future stop at Spring Street. These stops are absent in the PLL proposal.

**Mobility improvements** look at user benefits, service to low-income households and service to employment. The only measure available is the proxy for user benefits, which is discussed below as part of cost effectiveness.

**Readiness to go to construction** is not a stated FTA criterion, but it may have an influence on their decision-making process. As an outside date, the authorization is only good for six years, the maximum expected life of the new Surface Transportation Act. If the project was not approved by FTA and a Full Funding Grant Agreement not signed in that period, it would have to go for reauthorization. The IPL can have a final Environmental Impact Statement in 2003. Adding the Purple Line Loop as an alternative would add 18 to 24 months to the EIS process.

If the PLL is most locally desirable, the most effective means of ensuring the success of the PLL would be to begin with a new DEIS, including Federal agency concurrence on a newly defined Purpose and Need that would focus on the operational benefits of connecting the sides of the Red Line with Metrorail service. Returning to the Purpose and Need statement would mean that circumferential rail in this corridor would be set back by about four years.

## 2. Staff Critique of WMATA Capital Cost Estimate

M-NCPPC staff finds that the \$616M capital cost estimate provided on January 22, 2003, by WMATA for the PLL is not appropriate for comparison to the \$371M capital cost estimate provided by MTA for the IPL. Staff suggests that \$746M is a more appropriate capital cost estimate for the PLL. The difference of \$130M in PLL estimates is attributable to the following items:

- \$35M for aerial structure in locations where WMATA presumed an at-grade alignment
- \$14M for a parking garage associated with the Connecticut Avenue station
- \$81M for levels of project contingency more appropriate for project planning analyses than assumed by WMATA design engineers.

Each of these items is discussed in greater detail below.

### *Aerial versus At-grade Alignment*

The PLL follows the Capital Beltway alignment for approximately two miles. WMATA has not yet developed an explicit profile (i.e., an assessment of the grades and vertical curves) to accompany the concept plan, but has assumed that three segments, totaling approximately 4,550 linear feet, can be built at



grade adjacent to the Capital Beltway. Staff disagrees and concludes that all 4,550 feet will require aerial structure, for the following reasons.

- The easternmost of the three segments is between Linden Lane and Rock Creek/Beach Drive. WMATA assumes the PLL will be above Linden Lane and will transition from aerial to at-grade structure approximately 300 feet west of Linden Lane. Linden Lane has an elevation of 282 feet at the north end of the Capital Beltway, so a Metrorail crossing above Linden Lane would need to have an elevation of at least 295 feet. At the Rock Creek bridge, 2,000 feet to the west, the Capital Beltway has an elevation of 225 feet. The 70-foot difference in elevation along 2,000 linear feet is an average grade of 3.5%. WMATA's maximum grade for Metrorail is 4.0%. Therefore, even discounting the complicating effects of developing the maximum grade through vertical curvature, staff finds that the entire segment between Linden Lane and Rock Creek would need to be on aerial structure as the PLL "chases the grade" of the Capital Beltway into the Rock Creek stream valley.
- The central of the three at-grade segments is a 2500-foot segment between the Rock Creek/Beach Drive crossing and the Connecticut Avenue crossing. Within this segment, Rock Creek is immediately adjacent to the Capital Beltway, with typically 60 feet between the edge of current pavement and the stream bank, a result of stream channel relocation when the Capital Beltway was constructed in the 1960s. In this section, staff proposes that the stream channel location and other associated environmental constraints would dictate PLL construction on aerial structure.
- The westernmost of the three at-grade segments is a 1,050-foot segment that is part of the transition between the aerial structure above Connecticut Avenue crossing and the tunnel beneath the Capital Beltway and Locust Hills community. At the eastern end of this segment, the Capital Beltway is located on a berm approximately 40 feet above the Rock Creek stream valley. Again, staff proposes that in consideration of the environmental resources in the stream valley, aerial construction would be warranted rather than lateral extension of the berm up to 40 feet above the stream valley.

The WMATA cost estimate of \$616M includes \$347M of line profile costs disaggregated by four profile types; at-grade/retained cut, aerial, cut and cover, and mined tunnel. Attachment 5 demonstrates that shifting the 4,550 feet described above from at-grade/retained cut to aerial structure would increase the capital cost by approximately \$35M. The unit costs in Attachment 5 reflect WMATA's total cost estimate for each profile type divided by mileage estimated by WMATA for each type. WMATA developed their cost estimates based on the recently completed Blue Line extension to Largo. The resulting unit cost estimates are generally consistent with WMATA planning guidelines. The \$103M per mile for mined tunnel costs is a bit lower than might otherwise be expected,

but conversely, the average costs per mile for the other three profile types are a bit higher than might otherwise be expected.

#### *Parking Garage at Connecticut Avenue Station*

The \$616M PLL estimate provided by WMATA includes an aerial station at Connecticut Avenue, but with inconsistent presentation regarding long-term parking capacity. During development of the “P3” alignment for the State’s Capital Beltway Corridor Study, WMATA developed conceptual plans for a 2,000-space garage at Connecticut Avenue. While PLL discussions have suggested that WMATA staff still proposes park-and-ride capacity at the Connecticut Avenue station, none is explicitly included in written materials provided by WMATA.

The travel demand forecasts prepared for this memorandum assumed unconstrained parking at Connecticut Avenue and indicated that approximately two-thirds of the Connecticut Avenue station patrons would arrive via auto (either park-and-ride or kiss-and-ride). Historically, M-NCPPC staff has supported adjacent community efforts to reduce Metrorail park-and-ride garage sizes. In considering all the above factors, staff recommends that some park-and-ride capacity should have been included in the WMATA concept. Using WMATA cost estimate guidelines, staff estimates that a 1,000-space parking structure (a compromise between the 2,000-space concept and no parking at all) would cost approximately \$14M.

#### *Contingency*

The \$616M PL cost estimate provided by WMATA indicates that a 7% contingency is included. This level of contingency may be appropriate at the design stage, but is lower than typically assumed in project planning. For comparison purposes, the \$371M cost estimate prepared by MTA for the IPL includes contingency factors for independent cost elements that range from 5% to 40%, with a “weighted average” of 22%. Staff recommends that a 20% contingency factor for all costs is appropriate at this level of project planning, where many design and mitigation elements remain uncertain or unknown.

Table 7 provides a summary of the WMATA and M-NCPPC capital cost estimates for the PLL. Since the Connecticut Avenue station is controversial, the

**Table 7: Staff Critique of WMATA Cost Estimates**

Cost Element	WMATA Estimates		M-NCPPC Estimates			
	Source: WMATA, 1/22/03		With Connecticut Avenue Station		Without Connecticut Avenue Station	
	Line Items	Subtotals	Line Items	Subtotals	Line Items	Subtotals
<b>Line Profile</b>						
At-grade/retained cut	\$82.921		\$45.389		\$45.389	
Aerial	\$94.403		\$166.890		\$176.468	
Cut and cover	\$52.933		\$52.933		\$52.933	
Mined tunnel	\$116.963		\$116.963		\$116.963	
<b>SUBTOTAL</b>		\$347.220		\$382.175		\$391.753
<b>Stations</b>						
Walter Reed	\$59.696		\$59.696		\$59.696	
Connecticut Avenue w/1000 space parking deck	\$60.293		\$60.293 \$14.000			
<b>SUBTOTAL</b>		\$119.989		\$133.989		\$59.696
<b>Red Line "Tie In" Costs</b>		\$34.839		\$34.839		\$34.839
<b>Other (Mobilization/Real Estate)</b>		\$114.434		\$114.434		\$114.434
<b>SUBTOTAL ESTIMATED COST</b>		\$616.482		\$665.437		\$600.722
<b>Revised contingency assumption</b>						
WMATA contingency at 7%		\$40.331		\$43.533		\$39.300
<b>SUBTOTAL without contingency</b>		\$576.151		\$621.904		\$561.422
MTA contingency at 20%		\$115.230		\$124.381		\$112.284
<b>REVISED ESTIMATED COST</b>		\$691.381		\$746.285		\$673.706

Note: Without the Connecticut Avenue station, the cost of aerial structure increases by approximately \$10M to reflect replacement of the 600' platform

M-NCPPC analysis reflects ridership and capital costs for options both “with Connecticut Avenue station” and “without Connecticut Avenue station”. As indicated by numbers outlined by bold borders, M-NCPPC estimates that the PLL cost estimate is \$746M with the Connecticut Avenue station and \$674M without the Connecticut Avenue station.

Certainly the differences in costs between the Purple Line Loop and the Inner Purple Line are not inconsequential. WMATA’s preliminary estimate of cost (which does not include adequate amounts for contingences, parking at Connecticut Avenue or the cost of a trail between Silver Spring and Bethesda) is \$246 million above the IPL. Most projects that get funding from FTA are matched dollar for dollar with local funds. This project will need an additional \$123 million of scarce local funds.

At the risk of going beyond the mandate given to staff, we would offer the following. If the purpose of the Purple Line Loop is to avoid nearby houses, give more breathing space to the Capital Crescent Trail and avoid all noise and visual impacts to some adjacent properties, it may be effective to cut and cover portions of the light rail on the Georgetown Branch right-of-way between Bethesda and Connecticut Avenue. This might increased the estimated \$370 million cost by 10%-20%.

### 3. Cost Effectiveness

As described above, cost-effectiveness has been one of the key measures used by FTA to evaluate New Starts projects. Cost-effectiveness of a proposed major investment is measured in terms of its added benefits and added costs when compared to lower cost options. The FTA guidelines for cost-effectiveness have changed significantly since the Georgetown Branch DEIS was completed in 1996. At the time that the DEIS was completed, the cost-effectiveness formula included was calculated as follows:

$$\text{C.E. Index} = \frac{\text{Capital Costs} + \text{O\&M Costs} - \text{Travel Time Savings}}{\text{New Transit Riders}}$$

Where:

**Capital Costs** = change in annualized capital costs compared with Base

**O & M Costs** = change in operating and maintenance costs compared with Base

**Travel Time Savings** = value of travel time savings for existing (Baseline) riders annually

**New Transit Riders** = attraction of new transit riders annually

The DEIS compares the “Build” scenario with TSM and No-Build scenarios. The TSM scenario is the Transportation System Management alternative, designed to achieve the goals of the project without a major investment in new facilities. The Baseline scenario used in the PLL analysis assumes a level of service between the No-Build and TSM alternatives in the DEIS, because it includes significant bus service improvements in the corridor already included in the CLRP.

Current FTA guidelines are being updated to include Hours of Transportation System User Benefits. This measure was not used in this study because the methodology has not been fully adopted in the region at this time. Travel time savings for existing riders does provide an indication of the relative levels of benefits for transit riders who would already be using transit, but would have reduced travel times with the PLL.

The following table shows the cost-effectiveness for the PLL alternative, with and without the Connecticut Avenue station, as compared with the IPL. The figures shown for the IPL are based on the latest available costs and ridership forecasts developed by M-NCPPC for this study. The table presents the annual costs (capital and O&M), annual ridership (total and new riders), and time savings (in hours and dollars). A value of about \$11.70/hour was used to convert time savings into dollars, the same value used in the DEIS.

Three cost-effectiveness indices are presented:

- **Cost per New Rider:** the cost-effectiveness as calculated in the Georgetown Branch DEIS.
- **Cost per Total Rider:** Annual costs (with value of time savings subtracted out) are divided by Annual Total Riders (boardings).
- **Cost per Hour Saved:** Annual costs (with value of time savings subtracted out) are divided by Annual Travel Time Savings (in hours).

**Table 8: Cost-Effectiveness Indices Using Revised Purple Line Loop Costs from M-NCPPC**

	PLL	PLL (No Conn)	IPL
<b>Costs (000's):</b>			
Total Capital	746,285	673,706	371,000
Annualized Capital Costs	55,693	50,277	30,053
Annual O & M	10,000	10,000	5,800
Total Annual Costs	65,693	60,277	35,853
<b>Ridership:</b>			
Total Daily Riders	34,000	29,700	29,000
Annual Daily Riders (thousands)	10,098	8,821	8,613
Daily New Riders	3,850	3,725	2,900
Annual New Riders (thousands)	1,143	1,106	861
Percent of Riders that are New	11.3%	12.5%	10.0%
<b>Time Savings:</b>			
Annual Time Savings (hours) for Base Riders	952,200	900,207	702,700
Value of Time Saved (\$ thousands)	11,131	10,523	8,215
<b>Cost-Effectiveness:</b>			
Cost Per New Rider vs Baseline	\$47.72	\$44.97	\$32.09
Cost Per Total Riders vs Baseline	\$5.40	\$5.64	\$3.21
Cost per Hour Saved	\$68.99	\$66.96	\$51.02

The cost-effectiveness measures show that the PLL is not as cost-effective as the IPL. The higher number of new riders on the PLL does not offset the much higher costs compared with the IPL. The resulting cost per new rider is \$48 for the PLL versus \$32 for the IPL. Cost per hour saved shows the same relative performance with greater time savings for the PLL not offset by much higher costs. The PLL has \$69 per hour saved as compared with \$51 per hour saved for the IPL.

#### 4. Concerns Regarding Design Criteria

Because the PLL proposal has been developed by WMATA engineers rather than through the National Environmental Policy Act (NEPA) process, minor changes to several critical design criteria that the MTA staff have spent years addressing could have substantial impacts on costs or delays. In addition to NEPA concerns, other WMATA assumptions may need to be changed. For example, WMATA has assumed they can maintain their minimum 18-foot separation from CSX. CSX has informed MTA that this number has been increased to 25 feet. MTA has reflected the additional 7-foot requirement in the IPL conceptual designs.

#### 5. Capital Crescent Trail Completion

The completion of the Capital Crescent Trail will be necessary as a separate project with the PLL and will have some cost associated with it that has not been determined. Completing the trail is included in the costs for the IPL.

#### 6. Other Environmental Impacts

Staff findings on the PLL identify specific concerns regarding environmental impacts. In summary, the natural environmental impacts of the PLL are estimated to be greater than those of the IPL. These are described in greater detail in the context of Federal study delays above. In summary, the natural environmental impacts of the PLL are estimated to be greater than those of the IPL.

#### 7. Reduced Metrorail Service to Northern Montgomery County

The most significant attribute of the Purple Line Loop is the one-seat ride to the Bethesda and Silver Spring CBDs and on to stations south of the CBDs. That attribute will, however, limit the theoretical capacity of stations north of Silver Spring and north of the Medical Center Station. The maximum line capacity of the Metrorail system is 26 trains an hour with eight-car trains. Today, north of Silver Spring and Grosvenor, six-car trains are in use at a pace of ten cars per hour. By 2025, it is anticipated that WMATA could use its full capacity of 26 trains per hour. With the Purple Line Loop, however, half of the trains arriving at Medical Center will come from Silver Spring, the other half from Grosvenor and north. If demands were even, that would mean that a maximum of 13 trains per hour could come from north with the other 13 trains coming from Silver Spring.

Certainly, with the PLL capacity north of Grosvenor could still be increased slightly from today's service of ten trains per hour. With the Purple Line Loop, ridership capacity

could be increased by about 75%, with additional cars per trains and more trains per hour. In any case, selection of PLL means that service north of Medical Center and Silver Spring would be at substantially lower levels than it would be with IPL; in essence, perpetuating the “turn back” service.

## **Findings That Favor Neither IPL nor PLL**

### **1. Feasibility**

PLL is feasible to construct from an engineering perspective using the WMATA staff assumptions. The design uses some unusual structures, but there is public land or land from CSX that would allow for construction, and there are no physical constraints that could not be overcome. The DEIS has already resulted in the same finding for the IPL.

### **2. Effect on Purple Line Extension to New Carrollton**

If there is Metrorail between Bethesda and Silver Spring, what happens to the connection from Silver Spring to all points east: Langley Park, College Park and New Carrollton? No matter what technology is used going east from Silver Spring, it may not be prejudiced by the PLL.

A continuation of Metrorail would be challenging. Physically, the rail line runs between the CSX tracks and space for a Y connection going east would be needed. Financially the costs would be very high. Metrorail needs to be always grade-separated and a lot of that separation would be from being underground. This would be a very expensive project, particularly on the basis of cost effectiveness. Getting light rail out of the Silver Spring CBD and through Takoma Park would have some similar challenges.

If the Metrorail Purple Line Loop leads to a light rail connection in Silver Spring, there will be a time added to trips for a transfer, but that would be offset somewhat by reduced travel time from Silver Spring to Bethesda. The increased total travel time and need to transfer will lower ridership projections and make the light-rail extension less cost effective.

JZ:RCH:kcw

## **ATTACHMENTS**

1. Review of Federal Surface Transportation Bill Reauthorization Process
2. Inner Purple Line Planning History
3. Definition of Environmental Features
4. Staff Critique of WMATA Line Profiles and Impact on Cost



## **ATTACHMENT 1: REVIEW OF FEDERAL SURFACE TRANSPORTATION BILL REAUTHORIZATION PROCESS**

The current Federal surface transportation legislation, titled Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21), was adopted in 1998 and is due to expire this October, 2003. It succeeded the groundbreaking Intermodal Surface Transportation Efficiency Act (ISTEA), which covered the Federal Fiscal years of 1991-1997. Both of these were very forward-looking bills that brought significant changes to the way our transportation networks are planned and operated and how Federal dollars were allocated and used.

One major aspect of any Federal transportation bill is the allocation of Federal transportation funds. TEA-21 had a spending authority of \$215 billion over the life of the legislation, with the actual amounts set each year by Congress, but with a floor of some \$203 billion. Much of this was allocated with formulas. However, there were about 1,800 individual “high priority” projects identified in the legislation with specific funds allocated to each of them. These “earmarks” are important for roadway projects as they remove the need for the project to compete with other projects within a state for the funds. In Montgomery County, TEA-21 had the Randolph Road interchange with US 29 as a line-item project.

One important note is that the presence of one of these projects in the bill does not increase the total amount of funds that come to a state. These projects are counted against the formula amount the state receives. However, it does largely assure that the project will be funded during the life of the bill.

For transit projects, the process is somewhat different than for roadways. Transit funds for new construction are separate from highway capital funding. New transit project approval is a multi-step process, with the Federal Transit Administration (FTA) playing a significant role. The general process is:

- Get on the Authorized list as part of the reauthorization bill established by Congress. This makes a project eligible for further review. Then, if on the list, conduct additional planning, engineering, environmental and other work to finalize the definition and design of the project, complete environmental review requirements, obtain a firm cost estimate, and line up non-Federal funding.
- Sign a Full Funding Grant Agreement with FTA, if selected using the “new starts” criteria among other considerations. This identifies the amounts of funds that FTA will request for a project, and what funds the applicant and others will provide.
- Receive an annual appropriation from Congress funding the FTA part of the agreement.

FTA uses the following as their criteria when considering projects for “new starts” funding. This paper does not try to quantify or even identify how the PLL or the IPL would meet these, as producing these is a complex and lengthy process. In Chapters 5

and 6, a few of these characteristics, or close surrogates, are forecast using the information available to staff at this time.

- Mobility improvement, measured by travel time savings, number of low-income households served, and employment near stations
- Environmental benefits, measured by change in regional pollutant emissions, change in regional energy consumption and EPA air quality designation
- Operating efficiencies measured by operating cost per passenger mile
- Cost effectiveness expressed as transportation system user benefits divided by incremental cost
- Transit Supportive Existing Land Use, Policies, and Future Patterns, measured by combined ratings of several factors.

Other factors such as non-Federal funding support and readiness of the project for implementation are also considered.

## **ATTACHMENT 2: INNER PURPLE LINE PLANNING HISTORY**

The IPL is a 4.4-mile master-planned transitway between Bethesda and Silver Spring along historic freight rail alignments. Plans for fixed-guideway (busway or rail) passenger transit service in this alignment have been developed over the past two decades.

- The November 1986 Georgetown Branch Master Plan Amendment designated the right-of-way for “public purposes such as conservation, recreation, transportation, and utilities.”
- The County purchased the westernmost 3.3 miles of Metropolitan Branch right-of-way abandoned by CSX in 1988.
- The January 1990 Georgetown Branch Master Plan Amendment recommended both a trolley and trail within the right-of-way, including 26 explicit recommendations and detailed conceptual plans for both a trail and a single-track trolley configuration.
- The January 1996 Georgetown Branch Transitway/Trail Draft Environmental Impact Statement (DEIS) compared the impacts of busway/trail and light-rail/trail alternatives to a No-Build and a Transportation Systems Management (TSM) alternative consisting of enhanced bus services on existing roadways.
- The Maryland DOT Capital Beltway Corridor Transportation Study began evaluating regional, circumferential, rail transit alternatives in the late 1990s, colloquially described as the “Purple Line”. The study analyzed six transitway alternatives (P1 through P6), three of which incorporated the 4.4-mile Georgetown Branch.

In 2001, the Maryland Transit Administration began project planning for the Capital Beltway Corridor Study “P6” alternative, a light-rail alternative between Bethesda and New Carrollton that incorporates the Georgetown Branch alignment. The State has initiated development of a Draft Environmental Impact Statement (DEIS) for the IPL East (Silver Spring to New Carrollton) and a Supplementary DEIS and Final EIS for the IPL (Bethesda to Silver Spring) that incorporates the need for increased double-track rail sections to accommodate current plans for the IPL East.

### ATTACHMENT 3: DEFINITION OF ENVIRONMENTAL FEATURES

**Wetlands:** According to both Federal and state wetlands statutes, a wetland is an area covered or saturated by surface or ground water for a long enough period of time to support a vegetation community that typically can live and adapt to water-saturated soil conditions. Only certain plants are able to grow and thrive in such wet conditions. Also many species of animals use wetlands for some portion of their life. Other species are completely dependent on damp soils and standing pools of water for their long-term survival.

Wetland impacts were defined as the amount of wetlands within the road right-of-way. This definition provides a measure of direct, physical disturbance, but does not necessarily reflect such impacts as: fragmentation of a wetland system; degradation of wetland plant community through reduction in size, introduction of non-native, invasive species along disturbed edges; degradation of a wetland system through change in hydrology in and around the wetland.

**Floodplains:** Floodplains are low-lying areas adjacent to streams, subject to intermittent flooding. Building permits are restricted within floodplains. This coverage was derived from the USDA Soil Survey of Montgomery County, Maryland, due to the fact that actual floodplain delineations have not been done uniformly over the entire county.

**Stream Crossings:** Stream crossings have a direct and significant negative impact on water quality. This is not only because sensitive buffer habitat is permanently removed and fragmented, but also crossings allow highly polluted road run-off to drain directly into the stream without the benefit of filtering through a naturalized buffer area.

GIS generally underestimates the location of streams, especially in headwater areas but is useful in comparing impacts among alternatives.

**Stream Buffers:** These were initially delineated by measuring a buffer of 150 feet from the outer edge of each side of the stream. This was expanded where the wetlands or floodplain extended beyond 150 feet, especially along the main stem of Rock Creek. Stream buffers are important because they generally contain environmentally sensitive areas such as the natural stream channel, riparian forests, floodplains, wetlands and adjacent steep slopes. Alteration of these areas exacerbates watershed erosion/sedimentation and contributes significantly to water quality degradation.

**Park Property:** Park property is defined as State, Federal, M-NCPPC, WSSC, Municipal, and Revenue Authority.

**Forests:** A forest cover layer for the county was created by combining the existing woodland planimetric layer with 1999 state forest resource inventory attribute data. The layer was then updated using the forest inventories completed as part of recent master plans. The resulting updated layer was used as the basis for delineating significant forest.

**Significant Forests** are defined as upland forest stands that are at least 100 acres in size, but also include riparian forest corridors that are at least 300 feet wide. Impacts to these areas were considered of primary importance to track. Larger forest stands contain more species diversity, provide higher levels of forest functional benefits, and have the potential to provide increasingly rare habitat for forest interior dwelling plant and animal species. Riparian forest corridors provide habitat and are avenues for wildlife movement, and they are critical for the protection of stream resources. Significant forests are extensive along Rock Creek, especially in the low-lying floodplains.

**Forest Interior Habitat:** is defined as any portion of a forest stand that is at least 300 feet inside the outer edge of the stand. Interior forest habitat losses are a combination of direct disturbance associated with a road, plus loss of interior resulting from the penetration of the forest interior and the creation of new outer forest edges, often resulting in a total loss of interior habitat exceeding direct impacts. There are three sections of affected interior forest north of the beltway in Rock Creek Park.

**Historic Properties:** The proposed Purple Line Loop Alignment would not take any historic properties. As the CSX right-of-way approaches I-495, the new tracks would run directly in front of the National Park Seminary Historic District. There is also the Forest Glen Historic District just north of I-495 and east of the CSX right-of-way. This proximity would initiate a review process to determine the extent (if any) of detrimental impact to the historic resources. This process (mandated by Section 106 of the National Historic Preservation Act) would be carried out by the State Office of Historic Preservation. It is M-NCPPC staff's assessment that the result of that process is likely to be a finding of no detrimental impact.

Attachment 5: Staff Critique of WMATA Line Profiles and Impact on Cost										
		WMATA conceptual estimate					M-NCPPC staff conceptual estimate			
		Based on WMATA 1/22/03 concept								
Segments		At grade / retained cut	Aerial	Cut/cover	Mined tunnel	TOTAL	At grade / retained cut	Aerial	Cut/co	
A		1000				1000	1000			
B				400		400			4	
C					1200	1200				
D				800		800			8	
E		1900				1900	1900			
F					1100	1100				
G		1100				1100	1100			
H		1500				1500	1500			
I			2000			2000		2000		
J		1000				1000		1000		
K			600			600		600		
L		2500				2500		2500		
M			3300			3300		3300		
N		1050				1050		1050		
O				1500		1500			15	
P					3800	3800				
TOTALS		10050	5900	2700	6100	24750	5500	10450	27	
Miles		1.90	1.12	0.51	1.16	4.69	1.04	1.98	0	
Cost (\$M)		\$82.921	\$94.403	\$52.933	\$116.963	\$347.220	\$45.389	\$166.890	\$52.9	
Unit cost (\$M) / MI		\$43.643	\$84.288	\$103.790	\$100.830		\$43.643	\$84.288	\$103.7	
<p>Segments where staff presumes aerial construction will be required are highlighted with borders:</p> <p>Segment J: Chasing grade from above Linden Lane to Rock Creek</p> <p>Segment L: Footprint minimization along Rock Creek stream channel</p> <p>Segment N: Parallel to Capital Beltway berm up to 40' high</p>										
<p>Note that the total linear distance does not include 1,200' for the two stations. Costs for this linear distance are included in the station cost.</p>										
<p>Unit costs are estimated by dividing WMATA's total cost by profile type by the mileage by profile type</p>										



## **Appendix C**

# **An Assessment of the Base Realignment and Closure Activities on AA/DEIS Travel Assumptions for the Purple Line**



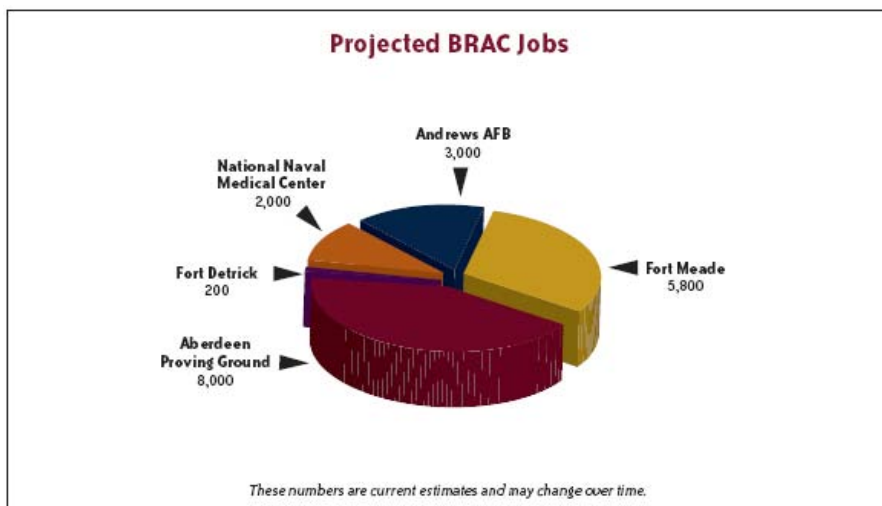


## **An Assessment of the Base Realignment and Closure Activities on AA/DEIS Travel Assumptions for the Purple Line**

**Introduction** - This report documents the changes to employment associated with Base Realignment and Closure (BRAC) activities at Bethesda Naval Hospital relative to the population and employment forecasts used in the AA/DEIS documents for the Purple Line AA/DEIS. This assessment includes an examination of the total employment changes in the Bethesda / Naval Hospital area, the expected origin location and travel patterns of work trips, and the potential effects on the usage of Purple Line alternatives and the potential effects of the BRAC vehicular traffic increase on the performance of the Purple Line alternatives, specifically the BRT Low Investment Alternative which would operate on Jones Bridge Road/Wisconsin Avenue and adjacent to the National Naval Medical Center (NNMC) in Bethesda..

### **BRAC Proposal for Bethesda Naval Hospital**

Maryland is expecting an influx of 20,000 jobs statewide as a result of latest proposed BRAC plans. The graphic below depicts the distribution of jobs for various facilities in Maryland.



Source: MDOT

As a result of BRAC, some of the existing functions of the Walter Reed Army Medical Center (WRAMC) in Washington DC will be transferred to the National Naval Medical Center in Bethesda, while other functions at Walter Reed will be transferred to Fort Belvoir in northern Virginia. The combined Bethesda facility – to be called the Walter Reed National Military Medical Center (WRNMMC) - will be the regional facility for both inpatient and outpatient care for both active and retired military personnel and a specialty center for severely injured military personnel. The military is combining the functioning of its Medical College complex located at the Bethesda facility with patient care to better integrate medical education and care functions at one location.

Planning and design is underway for the additional infrastructure at the facility needed at the WRNMMC, including additional medical facilities to support inpatient and outpatient services, additional lodging, a fitness facility and a new parking garage. There will be family quarters built to house families of service members who are working through the programs.

The BRAC legislation has identified a date of September 15, 2011 as the date for completion of the merger process and closure of the WRAMC. It is expected that by that time 2,200 additional staff members and an estimated 1,860 daily visitors will be added to the Bethesda campus. Of the 2,200, approximately 1,750<sup>1</sup> are expected to transfer from Walter Reed with the remaining 450 to be new staff to be added for maintenance and support.

One of the primary functions of the new facility will be to care for seriously injured service members with facilities to be added for traumatic brain injury, post traumatic stress disorder and aftercare spaces for those recovering from in-patient services. Air Force, Navy, and Army functions for these services will all be combined into one facility.

The 2005 estimated employment level at the NNMC facility was estimated at approximately 8,100 workers. The expected increase of 2,200 workers would bring the total to 10,300; representing a 27% increase over current employment levels at the facility.

### **Expected trip generation and travel patterns**

The NNMC DEIS contains information on the expected travel impacts to the surrounding road network associated with the increase in jobs at the combined facility. The analysis uses a transit mode split of 15% and the addition of 2,500 jobs. 2,500 jobs were used as a “worst case” scenario typical of traffic impact analysis.

Based the analysis, the impact of the shifting employment and visitor increases at the new facility is expected to generate approximately 860 additional trips into and out of the facility in the AM peak and approximately 910 additional trips into and out of the facility in the PM peak. The AM and PM peak hours for NNMC traffic were noted as being 6:30-7:30 AM and 4:15-5:15 PM. The AM and PM peak hours for the background traffic were noted as being 7:45–8:45 AM and 5:00–6:00 PM.

These trips were distributed geographically and temporally for this analysis based on current percentages of traffic traveling into and out of the gates and then analyzed for impacts to the surrounding road network.

Travel in the Bethesda / NNMC area will be affected by the increase in traffic associated with the increase in trips to the new WRNMMC. Peak hour volume increases were presented in the DEIS, based on the analysis noted above. The change in peak hour volumes attributable to base traffic includes:

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<sup>1</sup> BRAC Program Manager - NNMC

- A 3% increase to the intersection at Rockville Pike and West Cedar in the AM peak
- A 7% increase to the intersection at Rockville Pike and North Drive in the AM peak
- A 3% increase to the intersection at Rockville Pike and Jones Bridge Road in the PM peak
- A 4% increase to the intersection at Jones Bridge Road and Connecticut Avenue in the PM peak

Trips beyond the immediate study area and to the surrounding areas were also noted. The traffic generated is expected to add:

- 21 trips in the peak hour at the Jones Mill Road and East West Highway interchange (an increase of 2%) for the AM peak
- 39 trips in the peak hour (for the analysis lane) at Jones Mill Road and East West Highway (an increase of 3%) for the PM peak.

### **Planned Improvements**

BRAC legislation does not allow the commitment of funds to improve facilities beyond the borders of the bases themselves. Therefore Maryland Department of Transportation and Montgomery County have begun to assess impacts and determine the scope and timing of improvements in the base area. There have been a number of initiatives put in place. Some of these include:

- A study of improvements to the entry/exit gates (design and operations) at the combined facility
- An assessment of the potential of widening Rockville Pike along the WRNMMC frontage to accommodate widening of the roadway
- A study of improving the Metro station access
- Intersection improvements in areas noted as providing poor or degraded levels of service

The most recent State of Maryland Consolidated Transportation Program (CTP) includes the funding for the following project or initiatives:

### **Transit**

- \$201 million for the MARC Growth and Investment Plan
  - \$52 million for new MARC passenger coaches
  - \$125 million for MARC Penn Line improvements
  - \$17 million for MARC Camden Line improvements
- \$20 million for Commuter Bus Program
- \$9.0 million for Assessment of Transit Needs for BRAC
- \$6.8 million to Locally Operated Transit Systems

Specific to the NNMC the CTP includes:

Improvements Specific to National Naval Medical Center

- \$44.8 million in high priority intersection improvements; currently evaluating:
  - MD 355 @ West Cedar Lane
  - MD 355 @ Jones Bridge Road
  - MD 187 @ West Cedar Lane
  - MD 185 @ Jones Bridge Road
- Additional \$100 million for Purple Line Engineering and Design
- \$5 million for support of Ride-On for bus replacements

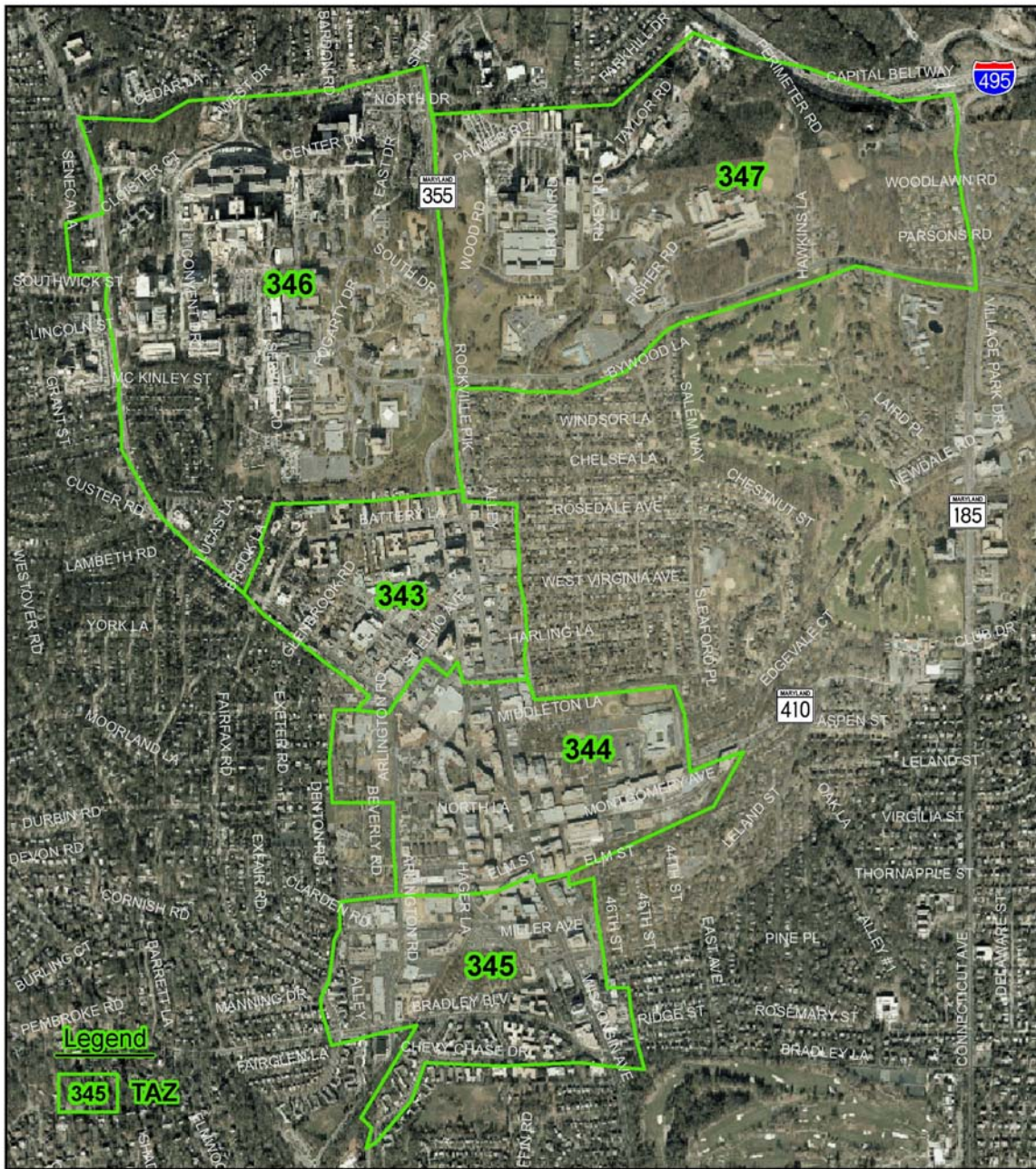
The findings from these studies and the timing for implementation of any associated improvements will not be available for review for some time.

**Population and Employment Changes in the Study Area**

Population and employment in the NNMC study area is expected to increase as a result of organic growth (non-BRAC related) in addition to the BRAC changes.

The Metropolitan Washington Council of Governments (MWCOC) released its most recent land use forecasts the Round 7.1 forecast which identifies expected future population and employment in the Medical Center / Bethesda CBD area. Figure 2 below identifies the expected land use growth for traffic analysis zones in the area as identified in this process. Zone 347 as shown below contains the NNMC/WRNMMC facility. For the entire Bethesda area population is expected to increase by 13,108 to 2030 and employment is expected to increase by 11,598 to 2030.





### Population & Employment Growth

Expected Population & Employment Growth - 2005 to 2030 [Bethesda / NIH / NNML]

TAZ	2005TOTPOP	2005TOTEMP	2030TOTPOP	2030TOTEMP	PERCENT CHANGE IN POPULATION	PERCENT CHANGE IN EMPLOYMENT
343	3634	7202	9328	7897	156.7%	9.7%
344	3895	19572	8128	22558	108.7%	15.3%
345	2968	8996	5479	10386	84.6%	15.5%
346	828	18053	965	22080	16.5%	22.3%
347	813	8142	1346	10642	65.6%	30.7%



Source: MWCOC Round 7.1 Forecasts

## Land Use Assumptions – Purple Line AA/DEIS

The table below compares the land use changes used in the Purple Line AA/DEIS and the most recent MWCOC forecast. The Purple Line AA/DEIS used the MWCOC Round 7.0 forecasts and later updates will use the Round 7.1 forecasts. As noted, the WRNMCC addition of 2,200 jobs is a partial contributor to the overall job increase of 4500 jobs (Round 7.0) or over 6,000 jobs (Round 7.1) forecasted at the NNMC area to the year 2030 with additional organic growth expected at NIH and WRNMCC combined. Residential growth is expected to be only in the 500 to 700 range. In contrast, the Bethesda CBD area is expected to show larger increases in population and employment adding an additional 12,000+ residences and 5,000 jobs.

**Table 1 - Aggregate Growth for Bethesda CBD and NIH/WRNMCC**

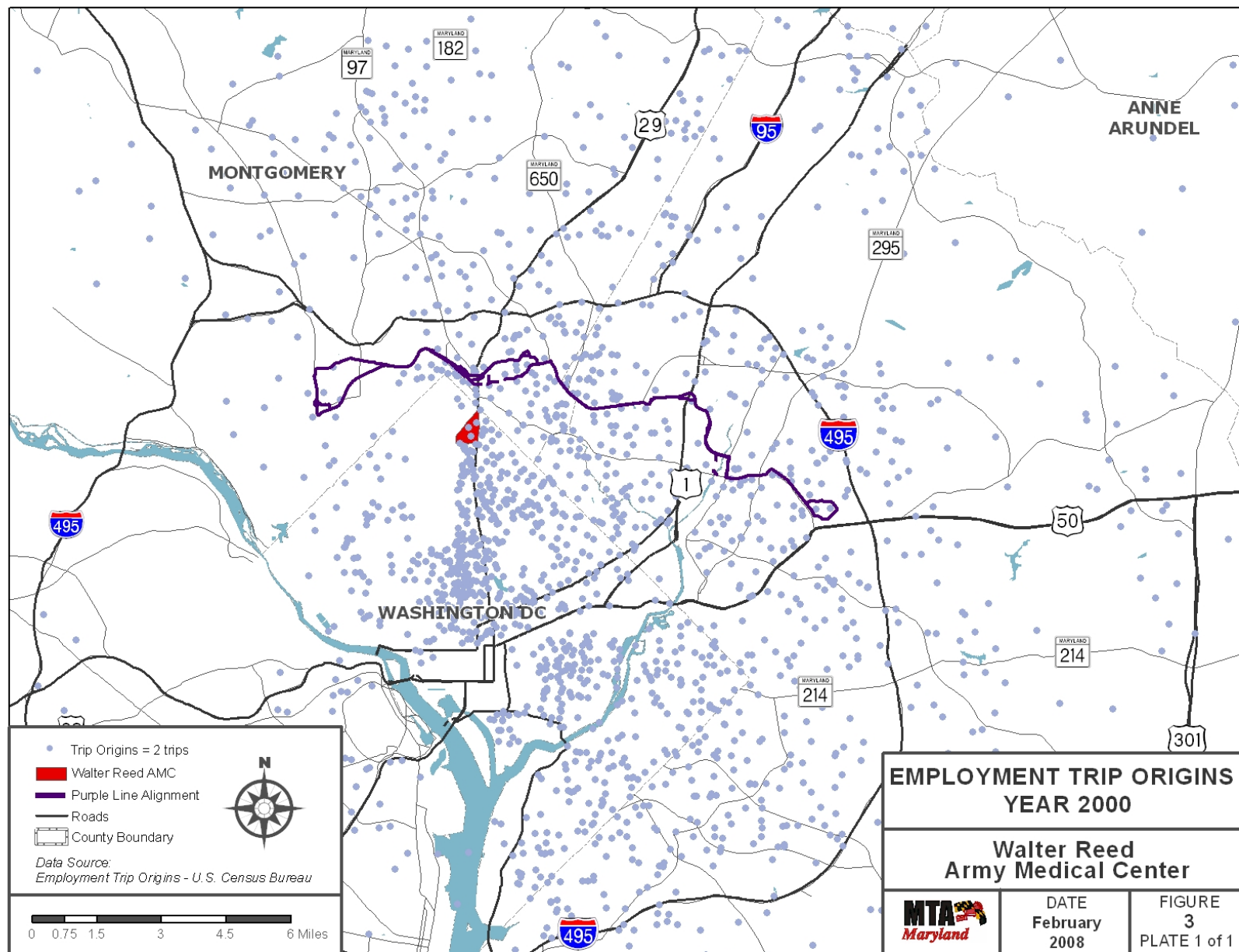
	2005 TOT POP	2030 TOT POP	% Change	2005 TOT EMP	2030 TOT EMP	% Change
<b>Bethesda</b>						
Round 7.0	11446	23184	103%	34833	41567	19%
Round 7.1	10497	22935	118%	35770	40841	14%
<b>NIH/NNMC</b>						
Round 7.0	1222	1762	44%	23801	28302	19%
Round 7.1	1641	2311	41%	26195	32722	25%

Overall, with the exception of the employment levels at NNMC, the changes in land use projections between Rounds 7.0 and 7.1 are comparable.

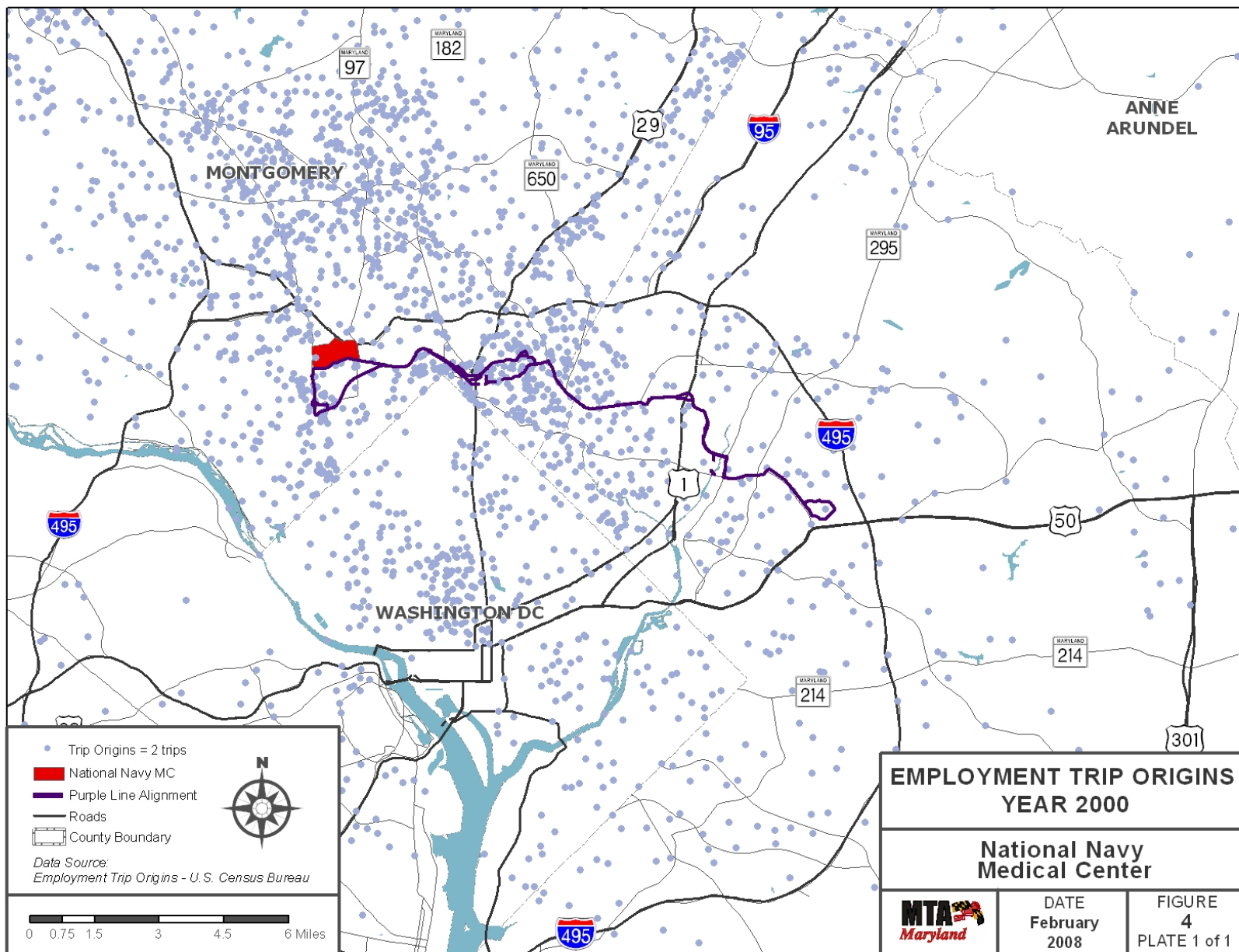
## BRAC employment growth at Bethesda Naval Hospital

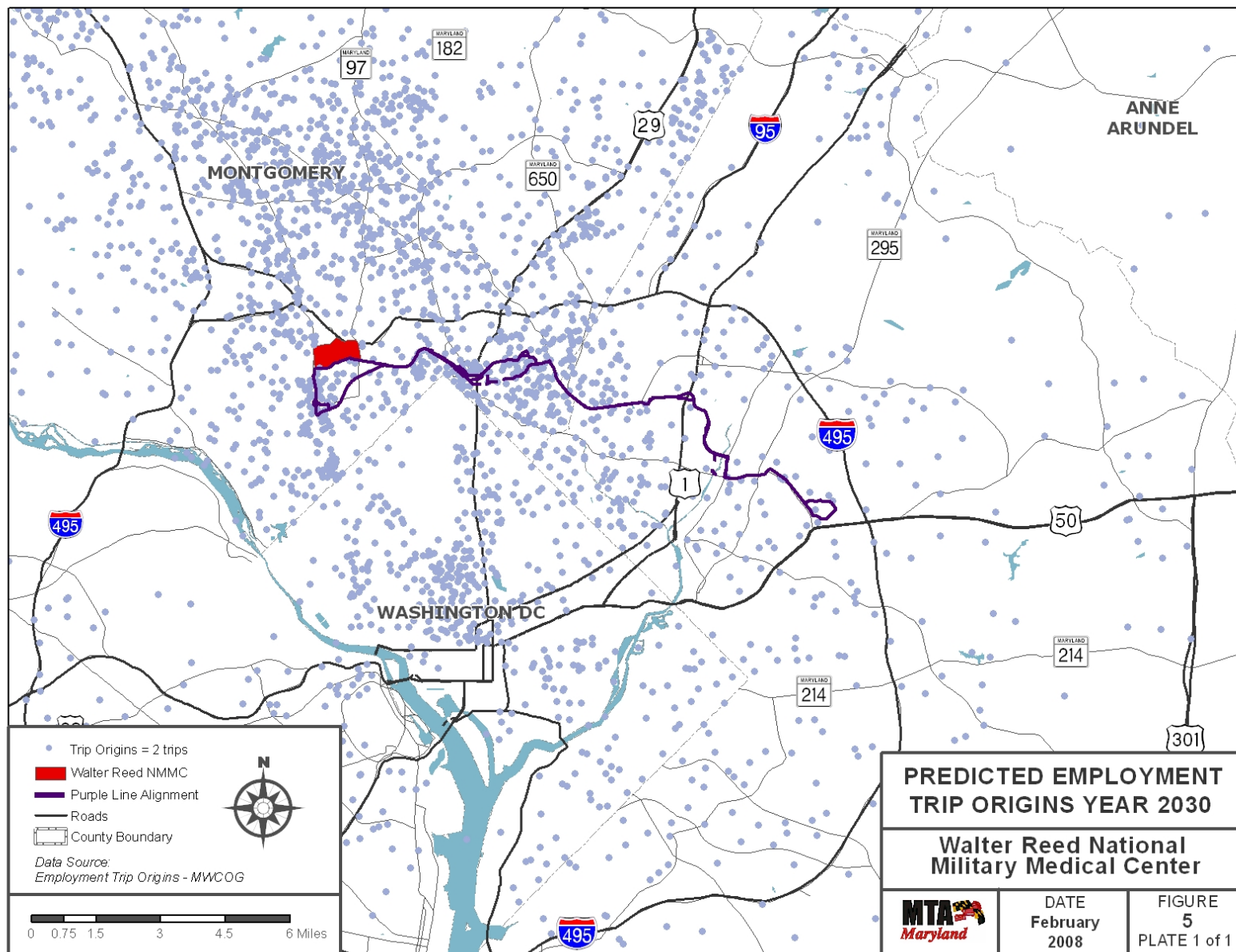
Walter Reed Army Medical Center in northeastern Washington, D.C. currently has approximately 6,000 workers. Of those, approximately 1,750 are expected to be transferred to the new facility in Bethesda. The remaining 450 associated with BRAC will be added to support ongoing efforts at the base.

In order to assess the potential effects of these employment shifts on the Purple Line ridership analysis, the home locations for workers currently working at Walter Reed were identified and their home location compared to the Purple Line service area. The next three figures show the existing employee trip origins for travel to the Walter Reed facility (assuming travel originates from the home location), existing trip origins to the NNMC complex and the predicted trip origins to the new combined facility for the year 2030.









Based on this analysis, approximately 650 Walter Reed employees currently live within the Purple Line service area. With the NNMC DEIS figure that approximately 30% of these employees will be transferred as part of the BRAC changes (1,750 out of 6,000), a total customer market of approximately 200 customers would be added to the peak hour (employment) trips to and from the new WRNMCC on a daily basis. Using a 30% transit mode share, approximately 60 current Walter Reed employees would use transit and some portion of these employees would potentially use the Purple Line transit service for travel to the WRNMCC in the peak hour. This trip could either be by way of the Master Plan alignment to Bethesda with a transfer to the Metrorail Red Line to the Medical Center Station or, in the one case of the BRT Low Investment Alternative, a route along Jones Bridge Road although the station would be on Wisconsin Avenue (Rockville Pike) just south of Jones Bridge Road. Under all the alternatives, existing bus services from Silver Spring Metro Station/Transit Center to the WRNMCC area would still be available.

### *Travel Times*

The Purple Line alternatives have their western termini at Bethesda at the Bethesda Metrorail Station. One alternative, BRT Low Investment, would operate on Jones Bridge Road, which borders the WRNMCC site along its southern edge. The station for the service would be on Wisconsin Avenue (Rockville Pike) south of the Jones Bridge Road intersection, twelve hundred feet south of the Medical Center Station that is located close to the security control entrance to the WRNMCC. Based on the operations plan for the Purple Line travel times from the Silver Spring Metrorail Station to Bethesda Metrorail Station and Medical Center Metrorail Station were derived given future traffic conditions. Travel times between Silver Spring station and the tunnel entrance to NNMC on Rockville Pike were calculated for comparison. Table 2 below identifies the results of this analysis

**Table 2 - Travel Time Analysis - Silver Spring to WRNMMC and Bethesda CBD**

<b>Travel Time Analysis - BRAC Impacts</b>			
Silver Spring to Medical Center		Silver Spring to Bethesda CBD	
Alternative	Travel Time	Alternative	Travel Time
Low BRT	24.8	Low BRT	24.5
Med BRT	20.6	Med BRT	13.1
High BRT	20.6	High BRT	13.1
Low LRT	18.7	Low LRT	11.2
Med LRT	16.3	Med LRT	8.8
High LRT	16.3	High LRT	8.8
Assumptions:			
Trip times calculated - Silver Spring Metro Station to tunnel / entrance to NNMC on Rockville Pike			
At Bethesda Station:			
2 minute walk time - platform to platform			
3 minute travel time Bethesda - Medical Center (WMATA)			
2.5 minute transfer delay at Bethesda station (WMATA)			
At Medical Center BRT stop:			
5 minute walk time - Medical Center BRT station to pedestrian tunnel at entrance to NNMC			

As a comparison it is estimated that TSM alternative improvements for transit connections between Silver Spring and Bethesda would yield transit service improvements that would allow for a 32 minute trip by bus between Bethesda Center and Silver Spring. A similar analysis for travel between Silver Spring and Medical Center identifies an expected future transit travel time (via bus) of over 35 minutes.

### **Traffic in the Bethesda/NIH/WRNMCC Area**

The potential increase in employment at the combined medical facility could be expected to worsen conditions along this roadway and could affect travel time for the Low Investment BRT alternative.

As part of the Purple Line AA/DEIS, a peak hour traffic operations analysis was conducted for the signalized intersections along the study corridor. Using 2005 field collected traffic counts as the base, peak hour projections were developed for the year 2030 based on an average annual growth rate of 1 percent per year over the 25-year period. In other words, the Purple Line traffic projections assume that during the peak hours, traffic will increase by approximately 25 percent over 2005 levels. The methodology used to determine this growth rate, which was based on the change in trips in the study area TAZs and an analysis of several key volume screenlines, was coordinated with the Maryland State Highway Administration, who concurred with the approach. It is important to note that while an average growth rate of 1 percent per year was assumed, traffic growth does not have to be linear. A specific major event, such as the expansion at NNMC, could result in faster growth during a short period, while the

total growth over the 25-year horizon would be expected to represent an average increase of 1 percent per year.

In comparison, the NNMC DEIS developed Year 2011 peak hour traffic projections based on standard traffic impact study procedures. These 2011 peak hour traffic projections included both the NNMC expansion and new trips associated with 11 proposed nearby developments. A comparison of the Year 2011 peak hour traffic projections to the existing traffic volumes at several key intersections along Jones Bridge Road indicate increases in the total peak hour traffic by 2011 of 5 to 10 percent. This equates to an average annual growth rate of between 1 and 2 percent. In applying an average annual growth rate of 1 percent per year, the Purple Line traffic projections accommodate the growth in peak hour traffic expected due to BRAC and allow for increased growth in traffic of approximately 15 percent between 2011 and 2030.

It was therefore concluded that the assumptions built into the Purple Line traffic analysis were conservative enough to reflect expected 2030 traffic conditions within a reasonable variance percentage. Travel time analysis was conducted for conditions noted in the Purple Line analysis. Further travel delay was not added the Purple Line traffic analysis or the Low Investment BRT alternative operations plan to reflect the impact of BRAC as the Purple Line analysis included a sufficient level of growth to reflect the effects.

### **Analysis Findings**

The analysis conducted for this study point to a few conclusions:

- Notwithstanding the growth in BRAC employment and organic growth in the NNMC area, the amount of growth forecasted for the Bethesda area is much higher. Downtown Bethesda remains a much larger travel market for a direct Purple Line transit service than the NNMC area.
- The impacts of BRAC implementation employment and activity growth in the Bethesda area will have a nominal affect on Purple Line transit ridership and traffic conditions in the area around the combined WRNMMC facility.
- The total impact of BRAC growth on potential Purple Line transit ridership is limited when evaluating existing home locations for WRAMC employees.
- Transit travel time to NNMC from Silver Spring and points east are comparable if not faster using the Purple Line alternatives operating along the Master Plan alignment to Bethesda and connecting to the Metrorail Red Line to Medical Center than transit service on Jones Bridge Road.
- Additional travel time delays to the Bethesda CBD as a result of the BRAC traffic increases would adversely affect the operation of the BRT Low Investment alternative, if it were chosen over other options.