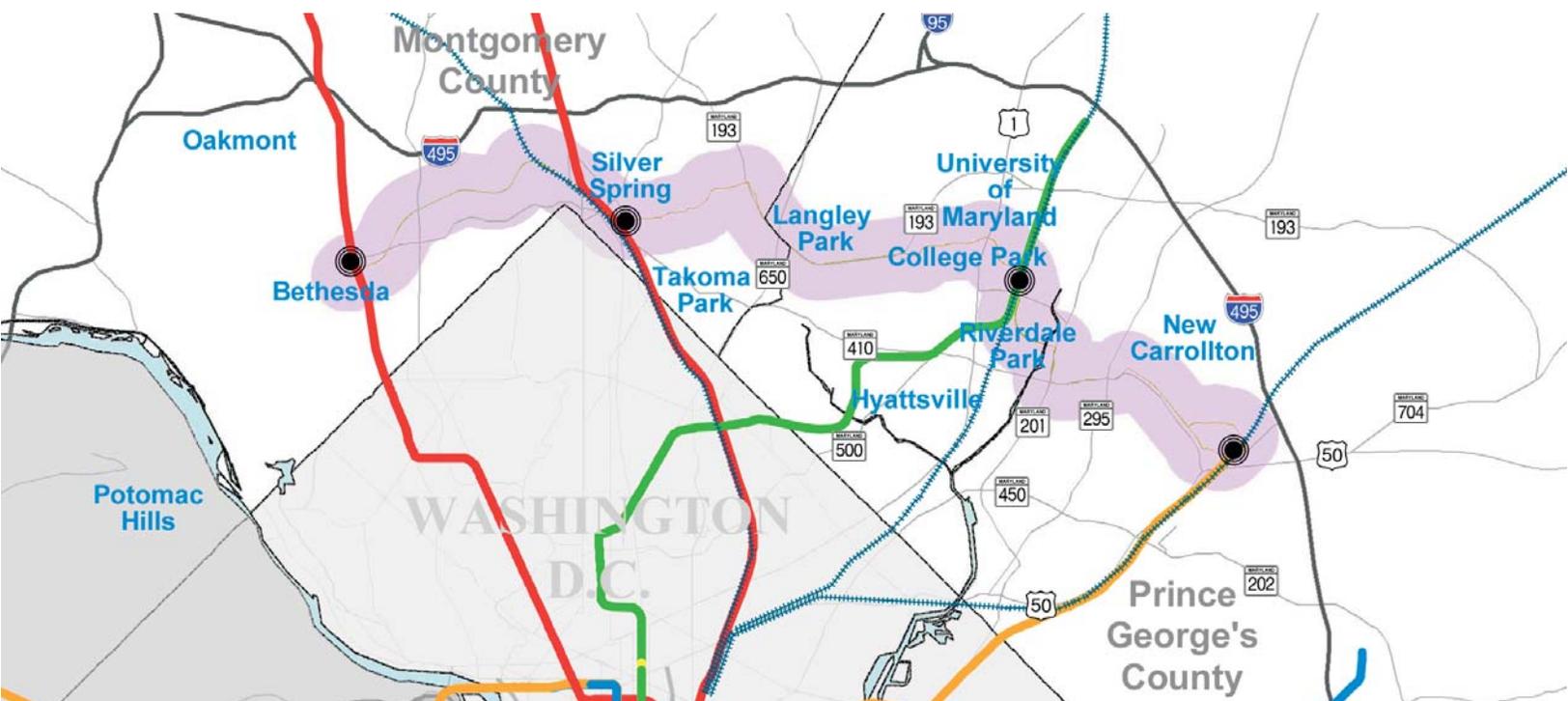


# Purple Line

*AA/DEIS*

## *Executive Summary*



U.S. Department of Transportation  
**Federal Transit Administration**



Maryland Department of Transportation



Maryland Transit Administration

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## **Executive Summary**

The Purple Line is a 16-mile rapid transitway extending from Bethesda in Montgomery County to New Carrollton in Prince George's County, proposed by the Maryland Transit Administration (MTA). It would provide direct connections to the Metrorail Red, Green, and Orange Lines; at Bethesda, Silver Spring, College Park, and New Carrollton. The Purple Line would also connect to MARC, Amtrak, and local bus services. In addition to providing connections to other transit services, the Purple Line would connect the major activity centers in the corridor. The alternatives under consideration include the No Build Alternative, the Transportation Systems Management (TSM) alternative, and six Build alternatives. The Build alternatives include three using bus rapid transit (BRT) technology and three using light rail transit (LRT) technology. The project would be designed and constructed in a manner that minimizes adverse effects on the environment and maximizes benefits to the communities.

This Executive Summary presents the major elements and findings of the study and includes a brief comparison of potential environmental effects of each alternative under consideration. A discussion of the next steps in the planning process for the Purple Line is also included.

### **Purpose of this Alternatives Analysis/Draft Environmental Impact Statement**

The Alternatives Analysis/Draft Environmental Impact Statement (AA/DEIS) compares the potential transportation and environmental impacts, costs, and benefits of the No Build, TSM, and Build alternatives under consideration.

The AA/DEIS summarizes the detailed technical data contained in the Technical Reports, incorporates that information by reference, and provides the information necessary to make an informed decision. A CD containing the AA/DEIS and the supporting Technical Reports, including methodologies and assumptions that provided the basis for the technical analyses and findings summarized in the AA/DEIS is attached to the printed version of the AA/DEIS document as well as to this stand alone version of the Executive Summary.

Both the AA/DEIS and the Technical Reports, are available on the project website, [www.purplelinemd.com](http://www.purplelinemd.com).

Printed copies of the AA/DEIS and supporting Technical Reports are available for public review at selected public libraries, Maryland-National Capital Park and Planning Commission offices in Montgomery and Prince George's County, Silver Spring Regional Services Center, and Maryland Department of Transportation Regional Office in New Carrollton, and (upon request) at the MTA offices located at 6 St. Paul Street, 9<sup>th</sup> Floor, Baltimore, Maryland 21202. Any person with special needs, such as English language assistance or Braille, should contact the MTA for assistance.



## Purpose and Need for the Purple Line

The purpose of the Purple Line is to address mobility and accessibility issues in the corridor between Bethesda and New Carrollton.

The project proposes to increase transportation choices for people living and working in the region; improve the quality of the existing transportation system; support local plans for economic development, community revitalization, and transit oriented development; improve system efficiency and intermodal connectivity; and help the region address air quality issues.

Improvements to the transportation system in the corridor would help address the following transportation challenges:

- Increasing congestion on the roadway system
- Slow and unreliable transit travel times due to the congested roadway system
- Limited travel mode options for east-west travel
- Degraded mobility and accessibility between activity centers, employment hubs, and residential areas
- Degraded transit accessibility to the larger metropolitan region due to inferior connections to radial Metrorail lines and to other rail and bus services

The Purple Line would increase mobility and improve access to jobs, recreation, and shopping for those traveling to, from, or within the corridor. The Purple Line will improve transit efficiencies linking multiple north-south routes with a convenient east-west connection and direct links to major activity centers.

A number of areas in the corridor are pursuing economic and community revitalization. Some of these areas are already the focus of economic incentive programs by local governments, and a substantial improvement in the quality of transit services has been identified by local planning agencies as a key factor in the success of these efforts.

Poor air quality affects the health of residents as well as the availability of federal funding assistance for transportation investments throughout the region. Almost half of the emissions that cause ozone in the region come from cars, trucks, and buses; and motor vehicle emission burdens

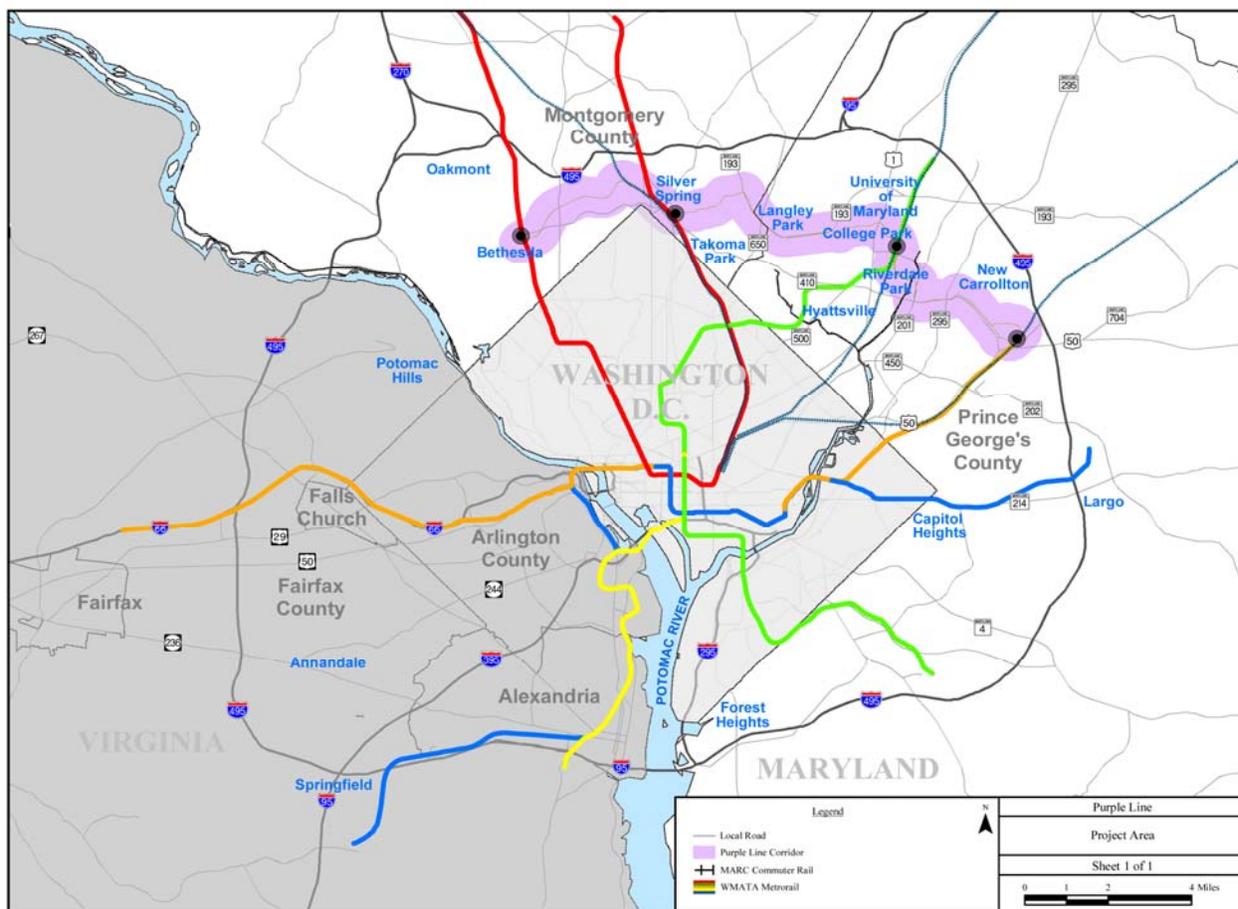
### Purpose and Need for Project

The purpose of the proposed project is to provide faster, more direct and more reliable east-west transit service in the Purple Line corridor, which would connect the four major activity centers, including the Metrorail services located there, to each other, and with the communities located between them. The existing and expected future roadway congestion in the corridor will have an increasingly detrimental effect on the travel times and reliability of east-west bus transit services in the corridor. The proposed Purple Line corridor transit improvements are intended to improve travel times and reliability by providing more direct services that will operate on dedicated and exclusive lanes and guideways.

are projected to increase substantially by 2030. The Purple Line would provide an alternative to automobile usage for those who work and live in the corridor, and thus could reduce the level of emissions from other vehicles.

Transit investments are very large capital and operating expenditures. It is clearly fiscally sensible to maximize the value of those investments by creating a system that will attract more riders by providing a reliable service that offers travel time comparable to or better than the automobile, and provide connectivity to other transit services.

## Project Area



## Summary of Alternatives

The AA/DEIS evaluates a No Build Alternative, a Transportation Systems Management (TSM) Alternative, and six Build alternatives. A range of Build alternatives has been examined, from modest investments in shared-use roadways, to major investments in a dedicated guideway, grade-separated where necessary, to determine which alternative achieves the greatest mobility and related benefits, balanced against costs and impacts on communities and the environment.



Two modes, BRT and LRT, were identified during the public scoping process as the most appropriate for this project.

The No Build Alternative assumes that no new improvements would be made to the transportation system in the corridor, other than those that are currently in local and regional transportation plans and for which funding for implementation by 2030 has been planned. Thus it consists of the transit service levels, highway networks, traffic volumes, forecasted demographics for the horizon year of 2030 and planned transportation projects that are assumed in the Constrained Long Range Plan of the Metropolitan Washington Council of Governments.

The TSM Alternative would include improved bus service in the corridor, a new through-route from Bethesda to New Carrollton replacing the existing WMATA J4 route, and overlaying service on portions of the WMATA F4/F6 routes between College Park and New Carrollton. A combination of limited stops and selected intersection and signal improvement strategies would be the core of service improvements. Standard buses would be used.

The TSM and 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 (shared, dedicated, or exclusive) and amounts of grade separation (tunnel or aerial structure).

### ***Bus Rapid Transit***

BRT is a versatile, rubber-tired rapid transit mode that combines stations, vehicles, services, and guideway into an integrated system with a strong positive image and identity. BRT's system of facilities, services, and amenities collectively improve the travel time, reliability, and identity of traditional bus transit. BRT can operate on existing roads or on a separate guideway or busway. BRT stations are similar to those of a rail transit system. Low, Medium, and High Investment BRT Alternatives are being evaluated.

### **BRT on Wayne Avenue**



Low Investment BRT would operate in the corridor primarily on existing roadways in lanes shared with traffic. It would include some minimal amount of dedicated bus lanes or exclusive rights-of-way. This alternative would primarily use existing streets to avoid the cost of grade separation. It would incorporate signal, signage, and lane improvements such as queue jump lanes, in locations where such enhancements provide benefits and are appropriate to the larger transportation system. It would cross intersections at grade. 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 at Rockville Pike and Jones Bridge Road.

The Medium and High Investment BRT would operate on the Georgetown Branch right-of-way and would include the construction of the Capital Crescent Trail between Bethesda and Silver Spring. Low Investment BRT would only operate on the Georgetown Branch right-of-way east of Jones Mill Road, and would include construction of the trail from that point east to the Silver Spring Transit Center.

Medium Investment BRT would operate in the corridor with a mix of shared lanes, dedicated bus lanes, and exclusive rights-of-way. This alternative uses these features where they provide maximum benefit relative to cost. Both Medium and High Investment BRT would operate in a 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 at both the existing Bethesda Metro Station on Edgemoor Lane and at the new southern entrance to the Metro station under the Air Rights Building.

High Investment BRT would operate almost entirely in dedicated bus lanes and exclusive rights-of-way. It includes aerial structures and tunnels in areas of congestion to provide faster and more reliable service. Wherever there were measurable benefits and physical opportunity, the BRT would be separated from existing traffic. Tunnels would be used in Silver Spring, the University of Maryland, and between River Road and East West Highway in Riverdale Park. Crossings of most of the major radial roadways would be either on bridges or in underpasses.

### ***Light Rail Transit***

LRT is an electric railway system characterized by its ability to operate single cars or short trains along rights-of-way at ground level, on aerial structures, and in tunnels. LRT can operate in mixed traffic or in a separate right-of-way. Similar to BRT, Low, Medium, and High Investment Alternatives are being evaluated. Because of the operational limitations of LRT on steep grades, some portions of all three LRT alternatives would be in tunnel.

All LRT alternatives would operate on the Georgetown Branch right-of-way and would include the construction of the Capital Crescent Trail between Bethesda and Silver Spring.

Low Investment LRT would be primarily an at-grade rail line. It could operate in shared lanes for much of the alignment with minimal use of tunnels or aerial bridges and dedicated lanes. Tunnels and aerial structures

would only be used where the topography results in grades too steep for LRT operations.

**LRT on Wayne Avenue**





Medium Investment LRT would be in dedicated or exclusive lanes where possible or most beneficial, with some key areas grade-separated. The Medium Investment LRT is generally the same as Low Investment LRT from Bethesda to the CSX corridor, except that the alignment would cross over Connecticut Avenue on an aerial structure.

High Investment LRT would operate almost entirely in exclusive lanes. Portions of the alignment would be grade-separated, either on aerial structures or in tunnel. This alternative would be the same as the High Investment BRT Alternative, except for the Bethesda terminus where the alignment would begin just west of the tunnel under the Air Rights building and would not include the loop through downtown Bethesda. The western terminal station would be the Bethesda Metro Station with a connection to the southern end of the existing Metro Station platform. 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.

East of the Silver Spring Transit Center all LRT Alternatives would operate on existing roadways or in tunnels. The amount of tunnel and exclusive or dedicated runningway would increase with the higher levels of investment.

Because of steep grades all LRT alternatives would be in tunnel from Wayne Avenue east of Manchester Road to Arliss Street, and all would pass under Adelphi Road at University Boulevard. The only exception to this is the Silver Spring/Thayer design option which does not use Wayne Avenue.

### ***Ongoing Planning***

The AA/DEIS presents a record of the planning for the Purple Line up to the current time; however, interaction with local communities, agencies, and other stakeholders continues, and ongoing studies may refine aspects of the alternatives, including possible additional design options. Two segments of the corridor under active study are the University of Maryland and the area east of downtown Silver Spring. Coordination with stakeholders will continue throughout the planning process and could modify aspects of the alternatives considered during the selection of the Locally Preferred Alternative. While six end-to-end alternatives have been defined and evaluated for the project, the ultimately selected Locally Preferred Alternative could be composed of an assortment of segments from alternatives at different levels of investment. Detailed descriptions of the alternatives are presented in the AA/DEIS.

## **Impacts and Mitigation**

All transportation projects have the potential to cause direct, indirect, or cumulative impacts to the social and natural environments. The Purple Line is anticipated to have beneficial impacts related to increased mobility and improved access to activity centers along the corridor, and minimal adverse impacts primarily related to potential noise and visual effects to communities. Findings of the analysis of impacts conducted on environmental features in the corridor are briefly summarized below.



### ***Communities***

Community effects considered include residential property displacements and acquisition, access, mobility, parking, community cohesion, visual effects, community facilities, and noise.

The No Build and TSM Alternatives would not require property acquisitions. The Build alternatives would require between 3 and 12 residential properties, depending on the Alternative. Strip takes along some segments of the alignments would be required under each of the Build alternatives.

The TSM and Build alternatives would improve mobility and access for all of the communities, including access to community facilities.

There are no impacts to public parking anticipated as a result of the No Build and TSM Alternatives, although increased traffic volumes in the future may result in the reduction or elimination of parking on the increasingly congested roadways. Each of the Build alternatives is anticipated to require expanded restrictions to public parking in some locations and elimination of some public on-street parking spaces.

The No Build and TSM Alternatives would not affect neighborhood cohesion. Increasing traffic levels resulting from increases in population and economic development independent of the Purple Line may adversely impact neighborhoods. The only place the Purple Line would affect community cohesion is along the Georgetown Branch right-of-way where the currently unrestricted crossing of the trail would be restricted to specific locations. This would occur under all the Build alternatives except Low Investment BRT.

### ***Environmental Justice***

The adverse effects of the Build alternatives are not disproportionately borne by environmental justice populations.

The Purple Line benefits of improved mobility and accessibility to locations in the corridor and other transit service are largely a function of the station locations. The Purple Line station locations were selected based on the density of development, the presence of activity centers, the location of stops of other transit services to provide convenient transfers, and high levels of transit ridership. The stations are distributed along the corridor and serve all communities, including environmental justice communities. Therefore, environmental justice populations will not be denied the benefits of the Purple Line.

Full and fair access to meaningful involvement by low-income and minority populations in project planning and development is an important aspect of environmental justice. Participation by low-income and minority populations in the Purple Line decision-making process has been advanced by: expanded outreach to environmental justice communities; meetings with community leaders; city and county agency staff, and local elected officials; and the translation of project newsletters, fact sheets, and Open House announcement posters into Spanish.



### ***Cultural Resources***

The Purple Line Build alternatives could adversely impact one eligible historic standing structure resource, and four archaeological sites. Should a Build Alternative be selected, a detailed analysis of impacts on cultural resources will be conducted. Avoidance and minimization will be considered wherever feasible. Should adverse effects occur an appropriate mitigation plan will be developed by the MTA in coordination with the Maryland Historical Trust and other consulting parties, as appropriate. The No Build and TSM Alternatives are not anticipated to impact cultural resources.

### ***Visual Effects***

The No Build and TSM Alternatives are not anticipated to have visual effects. Visual impacts are not anticipated under the No Build and TSM Alternative. Visual impacts will occur under each of the Build alternatives. Primary visual impacts of concern are to those locations where transit is being introduced including along the Georgetown Branch right-of-way, on Thayer Avenue and Piney Branch Road for the Silver Spring/Thayer Avenue design option, and along the Preinkert/Chapel Drive design option through the University of Maryland campus. Mitigation measures would be made in coordination with local communities and jurisdictions should a Build Alternative be selected. Minimization and mitigation could include landscaping, fencing, or other screening such as earth berms, roadway surface treatments, use of existing poles or buildings to support the trolley wires or new signage, and architectural treatments of structures.

### ***Parks, Recreation, and Open Space***

The No Build and TSM Alternatives are not anticipated to effect parks, recreations area, or open space. Of the 53 public parks, recreation, and open space areas in the corridor; eleven parks, five open space areas (schools) and five trails are anticipated to be impacted by a Build Alternative. Individual park impacts are all less than an acre. Total impacts to parks from the Build alternatives range from 8.77 acres for Medium Investment BRT (with the Preinkert/Chapel Drive design option) and 16.15 acres for Low Investment BRT. A majority of this acreage is open space or recreation areas on the University of Maryland campus. The University has plans to redevelop some of this acreage as part of their master plan. It is anticipated that these impacts would be minimized during later stages of the planning process.

The development of early resource inventories and conceptual engineering activities to keep the transit alignment within existing rights-of-way as much as possible, helped to avoid or minimize the impacts on many of the public parks and recreation areas in the corridor. The potential impacts are not expected to alter the use or function of the parks or impede access. The Purple Line would benefit park users by providing direct access to the parks by transit. Subsequent engineering activities would seek to further minimize impacts whenever practical. De minimis impacts on publicly-owned parks, recreation areas, and open space are defined as those that do not “adversely affect the activities, features and attributes” of the Section 4(f) resource. The MTA intends to pursue a finding of de minimis impact to the parks, recreation areas, and open spaces in the corridor that have potential impacts from the Build alternatives.



### ***Air Quality***

The Purple Line is not predicted to cause or exacerbate a violation of the national air quality standards and is not expected to measurably increase regional emission burdens or Maryland state levels. The Purple Line is also not expected to violate the PM<sub>2.5</sub> standard.

### ***Noise and Vibration***

The No Build and TSM Alternatives are not anticipated to have noise or vibration impacts. Moderate noise impacts from transit line operations are anticipated to result from BRT alternatives in Silver Spring along the CSX corridor, on Wayne Avenue, and on Arliss Street. The LRT design includes vehicle skirts that substantially minimize noise impacts. Therefore, no noise impacts are anticipated from LRT line operations. The Lyttonsville maintenance and storage facility would have moderate noise impacts from BRT, and no impacts from LRT. The Glenridge facility would have severe noise impacts from LRT only. Noise impacts at both facilities could be eliminated by the construction of noise walls between the facilities and the adjacent residential areas.

### ***Habitat and Wildlife***

The No Build and TSM Alternatives are not anticipated to impact wildlife resources. Impacts to wildlife resources by any of the Build alternatives are anticipated to be minor, and any wildlife corridors, especially within stream valley parks, would be maintained. Areas of forest interior habitat occur within the Rock Creek stream valley, the forested area east of Northwest Branch, north of University Boulevard, and north of Campus Drive within Paint Branch Stream Valley Park. The Purple Line would follow an existing trail or existing roadways through these habitat areas creating minor encroachment impacts necessary to accommodate the transitway.

Significant trees were not specifically identified within the project corridor during this stage of the planning process. However, forested areas and neighborhoods with street trees that appeared to contain a number of significant trees were mapped for identification, delineation, and surveying following the selection of a Locally Preferred Alternative.

Potential effects to aquatic habitat and water quality would be minimized by strict adherence to sediment and erosion control plans and stormwater management plans, which would be developed in accordance with state regulations to provide long-term mitigation of potential effects from stormwater.

### ***Rare, Threatened, or Endangered Species***

Based on information provided by Maryland Department of Natural Resources (DNR) and the U.S. Fish and Wildlife Service, no state or federally known rare, threatened, or endangered species are present within the corridor.

### ***Groundwater and Hydrogeology***

The No Build and TSM Alternatives are not anticipated to affect groundwater or hydrology in the corridor. The Low and Medium Investment BRT and LRT Alternatives and the proposed



maintenance and storage facilities are not expected to substantially affect groundwater. These alternatives and the maintenance and storage facilities would be completely constructed on the ground surface and only minor changes to the movements of the shallow groundwater table are likely during grading and construction. Any runoff would be treated in accordance with Maryland Department of the Environment (MDE) guidelines for stormwater management and released to surface waters. The tunnel components of the LRT and High Investment BRT Alternatives could affect groundwater by potentially causing a minor change in localized groundwater paths. These minor changes, however, are not expected to affect overall groundwater flows or quantities.

### ***Surface Water***

The No Build and TSM Alternatives are not anticipated to impact surface water. All of the Build alternatives and maintenance and storage facilities could increase levels of certain contaminants within the affected subwatersheds. These increases are expected to be greatly minimized with the use of approved sediment and erosion control measures during construction and implementation of stormwater best management practices, as required by MDE.

### ***Scenic and Wild Rivers***

The No Build and TSM Alternatives are not anticipated to impact scenic and wild rivers. All of the Build alternatives are anticipated to have minimal impacts to streams designated as scenic and wild because impacts are primarily associated with extensions of existing bridges and culverts to accommodate the BRT and LRT Alternatives rather than new stream crossings. Any impacts to Scenic and Wild Rivers will be evaluated as part of DNR's environmental review process for the project. Tributaries to Scenic and Wild Rivers in the corridor include: Little Falls, Sligo Creek, Northwest Branch, Northeast Branch, and Lower Beaverdam Creek.

### ***Floodplain***

The No Build and TSM Alternatives are not anticipated to impact floodplains in the corridor. The placement of substantial amounts of fill in floodplain areas is not anticipated for the at-grade components of the Build alternatives. However, fill may be placed in the 100-year floodplain in areas where the existing road berm may need to be extended to support the placement of aerial structures and the construction of grade separations. No impacts to 100-year floodplains are anticipated from the maintenance and storage facilities. Construction within the 100-year floodplain will require a Waterway Construction Permit from MDE.

### ***Waters of the United States, including Wetlands***

Impacts to Waters of the US, including wetlands, are not anticipated from the No Build or TSM Alternatives. Impacts from each of the Build alternatives range from one acre for the Low Investment BRT to 1.4 acres for Medium Investment LRT Alternatives. Effects to nontidal resources may require a Maryland Nontidal Wetlands Permit, a Section 401 Water Quality Certificate, and/or a Waterway Construction Permit from MDE, as well as a Section 404 permit from the U.S. Army Corps of Engineers for the discharge of dredged or fill material into Waters



of the U.S., including wetlands. Anticipated wetland impacts at either of the maintenance and storage facilities are minimal.

### ***Topography***

The No Build and TSM Alternatives are not anticipated to impact the topography of the corridor. Topographic impacts from each of the Build alternatives and their associated design options are expected to be minimal. Minimal grading would be required for the Lyttonsville maintenance and storage facility; however, the Glenridge facility is located on a steep hillside that would require extensive grading and fill to accommodate the infrastructure of a maintenance and storage facility.

### ***Geology***

Effects on geology in the corridor from the alternatives only apply to those sections of the alignments that involve tunneling, the High Investment BRT and all the LRT Alternatives. The No Build, TSM, Build alternatives, and maintenance and storage facilities that involve only surface construction would have little or no effect on geology. All of the tunnel options could change the geologic resources in the corridor, although these changes would be limited to the tunnel section itself, where rock or Coastal Plain deposits would be bored and removed for construction of the tunnel.

### ***Soils***

Because of the urbanized nature of the corridor, the majority of soils potentially affected by the project have already been disturbed, manipulated, or covered by development. No additional soil disturbances are anticipated for the No Build and TSM Alternatives. Additional soil disturbances would occur for all of the Build alternatives and maintenance and storage facilities, due to grading. Other potential impacts that could occur with any of the Build alternatives include changes to drainage patterns within or adjacent to the right-of-way. However, these effects should be minimal and will be reduced by required stormwater management facilities.

### ***Hazardous Materials***

An Initial Site Assessment identified 107 properties of relatively high potential for concern within the corridor. Such properties include automobile service stations that store and handle petroleum products and solvents. These sites may be impacted by right-of-way takes and would be investigated further should a Build Alternative be selected. This initial assessment does not preclude future use of these properties.

### ***Safety and Security***

Given that the streets along which the Build alternatives would operate already generally have high frequency bus operations, the types of conflicts among traffic, transit, and pedestrians under any alternative would be similar to conditions existing today. Traffic and transit controls would be used to manage any potential conflicting movements. The proposed transit facility would be designed to be compatible with the safe and secure use of the planned trails, as has been the



experience for similar facilities elsewhere. Tunnel portals would be designed to incorporate safety features appropriate to their locations.

### ***Utilities***

The construction of the transitway in a street will have little impact on deep utilities.

## **Comparison of Benefits and Costs**

Several other considerations play a role in the evaluation of the alternatives. First, because any transportation improvement must be a cost-effective investment, each alternative has been evaluated in terms of benefits produced compared to costs incurred. Second, because the transit farebox receipts generated by a transit service would be insufficient to cover its costs, the study identifies the potential need for, and sources of, additional funding for the capital, operating, and maintenance costs of each alternative. This could include various combinations of federal, state, local, and private sources. Finally, any transportation solution would be developed to be as environmentally sensitive and compatible with the natural, human, and built environments as possible. Any unavoidable adverse impacts would be minimized and appropriately mitigated.

Benefits, costs, and effects may be distributed unevenly across the population; therefore, the study examined alternatives in terms of who benefits, who pays, and who is subject to adverse effects. The framework for the evaluation involves the following:

- Effectiveness – how well each alternative addresses the purposes of the project
- Cost-effectiveness – the extent to which an alternative provides a level of benefits that is commensurate with its cost, and relative to the other alternatives
- Financial feasibility – the extent to which sufficient funding is available or can be developed to construct, operate and maintain the alternatives
- Equity – how well each alternative provides a fair distribution of costs and benefits to the various subgroups and communities in the corridor

As noted earlier, improvements to the transportation system in the corridor need to address the transportation challenges of traffic congestion, slow transit travel time, limited mode options, and degraded mobility and accessibility, and poor transit system connectivity.

Through extensive community and stakeholder outreach and the AA/DEIS technical analyses, a set of objectives and evaluation measures were developed for use in selecting the preferred transit investment in the corridor. These efforts identified that the consideration of transit improvements in the corridor was driven by factors beyond just mobility, accessibility, and transit operating efficiencies to include support for local plans for economic and community development, environmental quality, and optimizing public investment. These can be summarized as follows:

- Increase mobility and improve accessibility
- Improve transit operations efficiencies
- Enhance environmental quality
- Optimize public investment
- Support local plans for economic and community development
- Contribute to attainment of regional air quality standards

It is expected that Federal Transit Administration (FTA) funds would be sought if one of the Build alternatives is selected for implementation. Therefore, the goals and objectives in part reflect the evaluation criteria established by the FTA for potential projects eligible for funding under the Section 5309 New Starts process. This is a competitive process whereby communities across the country compete for federal financial assistance in starting a new transit project. The federal criteria and measures related to justifying the project are: mobility improvements; environmental benefits; operating efficiencies; cost effectiveness; transit-supportive land use and future patterns; and other factors.

In addition to the criteria above, the FTA considers the community's capacity to finance the proposed project. FTA has established a number of measures that help the community assess financial capacity, including the following:

- Stability and reliability of capital financing plan
- Stability and reliability of operating financing plan
- Local share of proposed costs

The issue of financial capacity is not directly applicable to the evaluation of the merits of the specific alternatives and ranking one alternative above another; however, it can affect a decision on the overall affordability of an alternative if its cost of construction or operating and maintenance exceed likely available financial resources. It underscores the importance, as expressed in the project justification criteria related to operating efficiency and cost-effectiveness, of minimizing the costs of the alternatives relative to the transportation benefits they provide to the region.

## **Attainment of Goals and Objectives**

A series of objectives were developed to support the project goals. The objectives were based on FTA New Starts guidelines and input from local agencies, stakeholders, and members of the public. Specific means of addressing the performance of the various alternatives in regards to how well each does (or does not) perform with respect to the goals include a mix of quantitative measures of effectiveness and cost effectiveness, and qualitative assessments. The sources for these measures were Maryland Department of Transportation (MDOT)/MTA, FTA New Starts Criteria, county and local jurisdictions and agencies, and corridor-specific needs and issues. The key measures, especially those that contribute substantially to differentiating between



alternatives, are summarized herein. This information is discussed in regard to effectiveness, cost effectiveness, financial feasibility, and equity and summarized in the Summary table.

## **Effectiveness**

### ***Increase mobility and improve accessibility***

The corridor has four major activity centers, Bethesda, Silver Spring, College Park, and New Carrollton, each with a substantial employment base and surrounding residential concentration and each with a Metrorail Station. Other key activity centers are the University of Maryland campus with 36,000 students and 12,000 employees; and the Takoma Park/Langley Park area.

The corridor is fully developed with residential communities of varying income levels. They all share a characteristic of relatively high transit usage and low automobile ownership – many by choice because of the transit access and connectivity provided by the Metrorail system and extensive bus systems. While fast and reliable transit service is provided by the Metrorail into Washington, DC and other activity centers along these radial routes, the transit service in the Purple Line corridor is hampered by slow and unreliable operations because it operates over a congested and indirect roadway network and often requires transfers between multiple transit routes and operators.

By 2030 and beyond, under the No Build conditions, the roadway congestion will increase due to population and employment increases, and vehicular trip growth, all of which will worsen transit travel times and reliability along this corridor. While Metrorail does provide some connectivity options for these trips, it requires taking circuitous routings into downtown Washington, DC and back out again. Several communities in the corridor, especially the Takoma-Langley Park area, are in a wedge between the Metrorail lines and do not even have this option.

The TSM Alternative would provide a bus service that would operate as a single route for the entire corridor length and would not make as many local stops to improve travel times between the major activity centers. However, this service would be hampered by the same increasingly congested roadway conditions as the current and future No Build bus services.

Because they would have similar alignments and stations, all the Build alternatives, as well as the TSM Alternative, would serve essentially the same travel markets: providing access to the major activity centers in the corridor, especially the Metrorail and MARC services located at Bethesda, Silver Spring, College Park, and New Carrollton. The alternatives differ in the travel times and reliability they would provide. High Investment LRT provides the fastest travel times along the corridor because of its higher investment in tunnel segments that provide a travel time advantage over surface alignments. By providing less grade separation or less exclusive surface running operating environments, Low and Medium Investment LRT would have slower travel times than High Investment LRT. The LRT alternatives would have faster end-to-end travel times than their BRT counterparts. West of Silver Spring, the BRT alternative travel times are longer than their LRT counterparts because of routing differences. Because of the need to turn the buses around, the westbound High and Medium Investment BRT would operate in a loop,



### Summary of Key Evaluation Measures for Alternatives

Objective	Evaluation Measure	No Build	TSM	Low Investment BRT	Med Investment BRT	High Investment BRT	Low Investment LRT	Med Investment LRT	High Investment LRT
<b>Increase Mobility and Improve Accessibility</b>									
<ul style="list-style-type: none"> <li>Improve accessibility to existing and planned economic development areas in the corridor</li> <li>Improve access to jobs in corridor</li> <li>Increase employers' access to labor pool</li> </ul>	<ul style="list-style-type: none"> <li>User Benefits by Alternatives, 2030 (daily minutes)</li> </ul>	--	401,200	623,700	851,200	994,200	1,033,700	1,098,200	1,211,8000
	<ul style="list-style-type: none"> <li>Percent over TSM</li> </ul>	--	--	56%	112%	148%	158%	174%	202%
	<ul style="list-style-type: none"> <li>User Benefits with Mode-Specific Attributes by Alternatives, 2030 (daily minutes)</li> </ul>	--	401,200	702,300	1,022,200	1,258,000	1,180,600	1,303,800	1,489,600
	<ul style="list-style-type: none"> <li>Percent over TSM</li> </ul>	--	--	75%	155%	214%	194%	225%	271%
	<ul style="list-style-type: none"> <li>Accessibility of residents to employment: jobs within ¼ to ½ mile of stations</li> </ul>	All alternatives have very similar alignments and station locations. Therefore, these accessibility measures are not a differentiating factor among the alternatives.							
	<ul style="list-style-type: none"> <li>Accessibility of employers to workers: households within ¼ to ½ mile of stations</li> </ul>								



### Summary of Key Evaluation Measures for Alternatives (continued)

Objective	Evaluation Measure	No Build	TSM	Low Investment BRT	Med Investment BRT	High Investment BRT	Low Investment LRT	Med Investment LRT	High Investment LRT	
<b>Increase Mobility and Improve Accessibility (continued)</b>										
<ul style="list-style-type: none"> <li>• Reduce travel time between activity centers:               <ul style="list-style-type: none"> <li>○ Bethesda – Silver Spring</li> <li>○ Bethesda – Takoma/Langley Park</li> <li>○ Bethesda – UM Campus Center</li> <li>○ Silver Spring – Takoma/Langley</li> <li>○ Silver Spring – Riverdale Park</li> <li>○ Silver Spring – UM Campus Center</li> <li>○ Silver Spring-College Park Metro</li> <li>○ Takoma/Langley – Riverdale Park</li> <li>○ East Silver Spring – Silver Spring</li> <li>○ East Silver Spring – Takoma Langley</li> <li>○ New Carrollton – Riverdale Park</li> </ul> </li> </ul>	Peak transit travel times for alternatives in 2030 (minutes)	Current								
		20	35	33	25	19	19	12	9	9
		38	65	61	51	38	33	29	26	23
		49	81	76	66	49	40	38	34	30
		19	31	29	26	19	14	18	17	14
		44	67	62	59	43	33	39	38	32
		29	47	44	41	30	22	26	25	21
		36	56	53	52	36	28	32	31	27
		25	36	34	33	24	19	22	22	19
		5	8	8	8	7	5	7	7	4
		14	23	21	19	13	10	11	11	10
		11	15	12	13	13	10	13	13	10

### Summary of Key Evaluation Measures for Alternatives (continued)

Objective	Evaluation Measure	No Build	TSM	Low Investment BRT	Med Investment BRT	High Investment BRT	Low Investment LRT	Med Investment LRT	High Investment LRT	
<b>Increase Mobility and Improve Accessibility (continued)</b>										
<ul style="list-style-type: none"> <li>• Reduce travel time between activity centers: (continued)               <ul style="list-style-type: none"> <li>○ New Carrollton – University of Maryland</li> <li>○ New Carrollton – Silver Spring</li> </ul> </li> </ul>	Peak transit travel times for alternatives in 2030 (minutes) (continued)	Current								
		25	35	30	31	25	21	25	25	21
		54	81	73	72	55	43	51	50	42
<ul style="list-style-type: none"> <li>• Improve mobility for transit-dependent households</li> </ul>	<ul style="list-style-type: none"> <li>• Number of zero-car households within ¼ mile of stations</li> </ul>	All alternatives have very similar alignments and station locations. Therefore, these accessibility measures are not a differentiating factor among the alternatives.								
<b>Improve Transit Operations Efficiencies</b>										
<ul style="list-style-type: none"> <li>• Increase interconnectivity of transit system, including bus-to-bus and bus-to-rail transfers</li> </ul>	<ul style="list-style-type: none"> <li>• Number of routes connecting at major transfer points</li> </ul>	All alternatives have very similar station locations and connectivity to other transit services. Therefore, this connectivity measure is not a differentiating factor among the alternatives.								
<ul style="list-style-type: none"> <li>• Integrate radial Metrorail and MARC lines for better transit system connectivity (also see below under Increase regional transit usage)</li> </ul>	<ul style="list-style-type: none"> <li>• Transfer walk time</li> <li>• Number of transfers required to access major activity centers</li> </ul>	All alternatives have very similar service plans and station locations. Therefore, these transfer measures are not a differentiating factor among the alternatives, except that the BRT alternatives provide better connectivity with the existing bus facility at the Bethesda Metro Station.								



### Summary of Key Evaluation Measures for Alternatives (continued)

Objective	Evaluation Measure	No Build	TSM	Low Investment BRT	Med Investment BRT	High Investment BRT	Low Investment LRT	Med Investment LRT	High Investment LRT
<b>Improve Transit Operations Efficiencies (continued)</b>									
<ul style="list-style-type: none"> <li>• Increase reliability of transit service</li> </ul>	<ul style="list-style-type: none"> <li>• Comparison of running way characteristics (miles):</li> </ul>								
	<ul style="list-style-type: none"> <li>○ Dedicated</li> </ul>	All shared	All shared 15.97	0.67	7.4	7.71	8.62	9.18	8.88
	<ul style="list-style-type: none"> <li>○ Exclusive</li> </ul>			1.97	4.85	9.37	5.73	5.74	8.81
	<ul style="list-style-type: none"> <li>○ Shared (with traffic)</li> </ul>			14.43	4.68	0.15	1.76	1.33	0.16
	<ul style="list-style-type: none"> <li>• Comparison of vertical alignment type (miles):</li> </ul>								
	<ul style="list-style-type: none"> <li>○ Aerial</li> </ul>	All surface running	All surface 15.97	--	1.26	1.63	1.06	1.06	1.73
	<ul style="list-style-type: none"> <li>○ Surface</li> </ul>			17.07	15.66	12.99	14.39	14.5	12.9
<ul style="list-style-type: none"> <li>○ Tunnel</li> </ul>	--			0.01	2.61	0.66	0.69	3.22	
<ul style="list-style-type: none"> <li>• Increase regional transit usage</li> <li>• Integrate radial Metrorail and MARC lines for better transit system connectivity</li> </ul>	<ul style="list-style-type: none"> <li>• Transit ridership (daily boardings)</li> </ul>								
	<ul style="list-style-type: none"> <li>○ Purple Line</li> </ul>	--	14,800	22,200	29,300	33,800	32,500	33,900	36,100
	<ul style="list-style-type: none"> <li>○ Purple Line via Metrorail</li> </ul>	--	2,100	16,700	21,100	23,700	25,300	27,200	30,500
	<ul style="list-style-type: none"> <li>○ Purple Line via MARC</li> </ul>	--	--	1,100	1,400	1,400	1,500	1,500	1,500
	Total	--	16,900	40,000	51,800	58,900	59,300	62,600	68,100
	New transit trips relative to No Build	--	8,200	11,400	15,300	17,700	18,200	19,200	20,500
	Percent new trips relative to No Build	--	--	14%	25%	29%	31%	32%	35%

### Summary of Key Evaluation Measures for Alternatives (continued)

Objective	Evaluation Measure	No Build	TSM	Low Investment BRT	Med Investment BRT	High Investment BRT	Low Investment LRT	Med Investment LRT	High Investment LRT
<b>Improve Transit Operations Efficiencies (continued)</b>									
<ul style="list-style-type: none"> <li>Reduce transit travel times in the corridor</li> </ul>	<ul style="list-style-type: none"> <li>Change in operating speeds of transit service</li> </ul>	--	9	10	13	16	15	16	19
	<ul style="list-style-type: none"> <li>Change in travel time between major activity centers</li> </ul>	See objective “reduce travel time between activity centers” above.							
	<ul style="list-style-type: none"> <li>End-to-end peak period running times Bethesda to New Carrollton (minutes)</li> </ul>	--	108	96	73	59	62	59	50
<ul style="list-style-type: none"> <li>Serve transit-oriented populations</li> </ul>	<ul style="list-style-type: none"> <li>Number of zero-car households within ¼ and ½ mile of stations</li> </ul>	All alternatives have very similar alignments and station locations. Therefore, these accessibility measures are not a differentiating factor between alternatives.							



### Summary of Key Evaluation Measures for Alternatives (continued)

Objective	Evaluation Measure	No Build	TSM	Low Investment BRT	Med Investment BRT	High Investment BRT	Low Investment LRT	Med Investment LRT	High Investment LRT
<b>Enhance Environmental Quality</b>									
<ul style="list-style-type: none"> <li>Minimize and mitigate impacts to the natural and human environment in the corridor</li> <li>Provide a safe and attractive transit service that is compatible with local community character</li> </ul>	<ul style="list-style-type: none"> <li>Direct impacts to natural resources</li> </ul>	<ul style="list-style-type: none"> <li>All alternatives have very similar alignments and station locations, and as a result, the natural environment impacts are not appreciably different between alternatives. The Build alternatives would impact between 1 and 1.4 acres of wetland, 13.5 to 15.1 acres of floodplains, and 3,892 to 5,719 linear feet of stream.</li> </ul>							
	<ul style="list-style-type: none"> <li>Direct impacts to parklands</li> </ul>	<ul style="list-style-type: none"> <li>Up to 11 parks, five open space areas (schools) and five trails, could potentially to be impacted by a Build Alternative.</li> <li>Individual park impacts are all less than an acre. Total impacts from the Build alternatives range from 1.98 acres for Low Investment LRT to 3.02 acres for Medium Investment BRT.</li> <li>Individual open space (public school) impacts range from 0.05 acre to 1.65 acres except for impacts to the University of Maryland, which range from 7.02 acres to 13.91 areas. Total impacts to open space from the Build alternatives range from 7.38 acres for Medium BRT Preinkert/Chapel Option to 14.46 acres for Low Investment BRT.</li> <li>Individual trail impacts range from 0.02 acre to 1.67 acres. Total impacts from the Build alternatives range from 1.29 acres for High Investment BRT Silver Spring/Thayer Option to 1.85 acres for Medium Investment LRT.</li> </ul>							
	<ul style="list-style-type: none"> <li>Direct impacts to historic properties</li> </ul>	<ul style="list-style-type: none"> <li>All BRT and LRT alternatives except Low Investment BRT could impact one historic standing structure resources, the Falkland Apartments.</li> </ul>							
	<ul style="list-style-type: none"> <li>Visual effects.</li> </ul>	<ul style="list-style-type: none"> <li>All alternatives have nearly identical alignments and station locations and result is similar visual effects, with the most substantial visual effects being along the Georgetown Branch right-of-way. The Preinkert/Chapel Drive and Silver Spring/Thayer Avenue design options would present additional substantial visual effects.</li> </ul>							
	<ul style="list-style-type: none"> <li>Direct residential property impacts (number of displacements)</li> </ul>	<ul style="list-style-type: none"> <li>All of the Build alternatives require residential displacements.</li> <li>Low Investment BRT has the fewest displacements (three single-family homes) while the High Investment BRT and LRT alternatives have the most residential displacements (ten single-family houses, several units from three buildings of two apartment complexes, and one duplex).</li> </ul>							



### Summary of Key Evaluation Measures for Alternatives (continued)

Objective	Evaluation Measure	No Build	TSM	Low Investment BRT	Med Investment BRT	High Investment BRT	Low Investment LRT	Med Investment LRT	High Investment LRT
<b>Optimize Public Investment</b>									
<ul style="list-style-type: none"> <li>Demonstrate that the overall benefits of the transit improvements warrant their capital and operating costs</li> </ul>	<ul style="list-style-type: none"> <li>Total capital cost (\$2007 in million)</li> </ul>	--	\$82.0	\$386.0	\$580.0	\$1,088.0	\$1,206.0	\$1,220.0	\$1,635.0
	<ul style="list-style-type: none"> <li>Annual operating and maintenance costs (\$2007 in millions)</li> </ul>	--	\$14.6	\$17.3	\$17.3	\$15.8	\$26.4	\$25.0	\$22.8
	<ul style="list-style-type: none"> <li>Annual increase in operating subsidy (\$2007 in millions)</li> </ul>	--	\$12.2	\$14.0	\$12.8	\$10.6	\$21.1	\$19.4	\$16.0
	<ul style="list-style-type: none"> <li>FTA cost-effectiveness measures (cost per hour of User Benefit)</li> </ul>	--	--	\$18.24	\$14.01	\$19.34	\$26.51	\$22.82	\$23.71
	<ul style="list-style-type: none"> <li>Annualized cost per new rider relative to No Build</li> </ul>	--	\$8.98	\$14.49	\$14.29	\$19.76	\$22.96	\$21.72	\$24.57



**Summary of Key Evaluation Measures for Alternatives (continued)**

Objective	Evaluation Measure	No Build	TSM	Low Investment BRT	Med Investment BRT	High Investment BRT	Low Investment LRT	Med Investment LRT	High Investment LRT
<b>Support Local Plans for Economic and Community Development</b>									
<ul style="list-style-type: none"> <li>Support local, regional, and state policies and adopted master plans</li> </ul>	<ul style="list-style-type: none"> <li>Consistency with local, regional, and state policies and adopted master plans</li> </ul>	<ul style="list-style-type: none"> <li>Only the LRT alternatives support the Montgomery County Master Plan, which calls for LRT between Bethesda and Silver Spring, with a trail along the Georgetown Branch right-of-way. All Build alternatives would support the Montgomery County Master Plan by constructing the permanent Capital Crescent Trail, although the Low Investment BRT alternative would not build the permanent trail west of Jones Mill Road. The Prince George’s County Master Plan supports the Purple Line in general, but does not identify a specific alignment. Both Montgomery and Prince George’s Counties are in the process of developing functional master plans for the Purple Line.</li> </ul>							
<ul style="list-style-type: none"> <li>Support potential for transit-oriented development at existing and proposed stations in support of local land use plans</li> </ul>	<ul style="list-style-type: none"> <li>Number and size of transit-oriented development opportunities</li> <li>Potential for new development</li> </ul>	<ul style="list-style-type: none"> <li>All alternatives have nearly identical alignments and station locations and similar volumes of service. Therefore, these development measures are not a differentiating factor among the alternatives except Low Investment BRT, which would not support the planned transit oriented development at Chevy Chase Lake. High Investment BRT and LRT would not have a station at Fenton Street, would therefore not support transit-oriented development at this location.</li> </ul>							
<b>Support Attainment of Regional Clean Air Goals</b>									
<ul style="list-style-type: none"> <li>Support attainment of regional air quality goals</li> </ul>	<ul style="list-style-type: none"> <li>Change in regional emission burden</li> </ul>	--	All alternatives produce small but beneficial changes in regional emissions						

leaving the Georgetown Branch right-of-way at Pearl Street operating on surface streets in downtown Bethesda, then returning to the Georgetown Branch right-of-way from Woodmont Avenue and continuing under the buildings on either side of Wisconsin Avenue. This would decrease the operating speeds of these alternatives. While this slower travel time would degrade the market attractiveness relative to the LRT alternatives for trips connecting to Bethesda Metrorail Station, these two alternatives would actually provide better access to the downtown Bethesda employment market. Low Investment BRT and the Medium Investment BRT variation via Jones Bridge Road, because of their routing along Jones Bridge Road and Woodmont Avenue, would have the slowest travel times between Silver Spring and downtown Bethesda although they would provide a direct connection to the National Institutes of Health/National Naval Medical Center area. However, these travel markets are already served by a number of transit services and are comparably or even better served by the other Build alternatives which use the Georgetown Branch right-of-way.

As the result of having similar alignments, station locations, and service plans, the attractiveness of the Build alternatives to the transit markets and the resulting user benefits would primarily be a function of the travel time improvement differences among the alternatives. The LRT Alternatives would attract more riders and new transit trips than the TSM and BRT Alternatives and would generate more user benefits. The High Investment alternatives under LRT and BRT would produce higher numbers of riders, new transit trips, and user benefits than their respective Medium and Low Investment Alternative counterparts or the TSM Alternative.

Due to the similarity of service, the number of residents, employees, transit-dependent populations, and zero-car household populations served by the alternatives would be virtually the same and therefore are not a differentiating factor among the alternatives.

For the same reason, transferring and interconnectivity to Metro, MARC, Amtrak, and bus services are not a differentiating factor among the alternatives, except that the BRT Alternatives would provide better connectivity with the existing bus facility at the Bethesda Metrorail Station.

In summary, High Investment LRT would be the most effective in addressing the mobility and accessibility objectives.

### ***Improve transit operations efficiencies***

When transit vehicles operate in mixed traffic or shared roadways, including traversing roadway intersections, the potential for delays increases. This in turn decreases the reliability of the service and lessens operational efficiency. Because of the investment in tunnel segments, grade separations, and dedicated lanes, High Investment BRT and LRT would provide the most efficient and reliable operations. Low and Medium Investment BRT and LRT would provide these benefits to a lesser degree.

Service with improved operating speeds enables more efficient operations as it requires fewer vehicles and operators to provide the transit service. The BRT Alternatives would have lower operating costs than the LRT Alternatives. However, further refinement of the services' operating plans relative to the ridership demand level may lessen these differences. The



incremental cost of adding more service is less for the LRT Alternatives than for the BRT Alternatives.

With the introduction of any one of the BRT or LRT Alternatives, as well as the TSM Alternative, there would be opportunities to adjust the existing and future bus network in the corridor in response to service redundancies, thereby reducing operating costs to the transit providers. These reductions would be similar across all alternatives.

### ***Enhance environmental quality***

All of the alternatives generally follow existing roadway or railroad rights-of-way. As a result, the environmental and community impacts are relatively minor in type and degree for projects of this nature. The roadways along which the alignment would run typically have high volumes of automobile, truck, and bus traffic operating along them.

The LRT and High Investment BRT Alternatives would have some tunnel segments, which would in certain instances run below ground under residential and commercial properties. The effects on the surface structures and communities would be negligible. The tunnel portals and tunnel vent and emergency exit shafts, where required, would be the most noticeable features.

Because all the alternatives would have similar alignment characteristics, impacts on parks, wetlands, historic properties, residential and business properties and other environmentally sensitive sites would be very similar between the alternatives, and are thus unlikely to be a key differentiating factor among the alternatives.

In some specific instances, the impacts are seen by some in the local communities as onerous – specifically the change in the character of the Georgetown Branch railroad right-of-way along which the Interim Georgetown Branch Trail is located. The re-introduction of rail operations with the LRT alternatives, in conjunction with the construction of the permanent Capital Crescent Trail segment, as called for in the Montgomery County Master Plan for several decades, or the introduction of BRT, would remove the trees within the right-of-way. The trees and vegetation on the properties abutting the right-of-way would be expected to remain and would maintain much of the tree cover and visual character. The design features and character of the transitway and trail are incorporated to mitigate these concerns. Some in the communities along certain street alignments, specifically Wayne Avenue, have concerns about LRT or BRT vehicles operating on the surface along this street adversely affecting the character of the street and adjoining neighborhoods. Others in the community view the introduction of these transit vehicles as compatible with the community character given that Wayne Avenue is already used by automobile, truck, and bus traffic.

### ***Optimize public investment***

Transportation system user benefits, community and economic benefits, and environmental benefits would be generated by all the BRT and LRT alternatives to varying degrees depending on the specific attributes of the alternatives. These benefits would generally increase with increased levels of public capital investment. Ongoing public investment in operating and



maintenance of the transit service would also be required. All the alternatives generate benefits and support a number of public objectives.

One measure that is useful for the comparative evaluation of the alternatives to show the degree of increased user benefits for increasing level of capital and operating costs is the FTA New Starts cost-effectiveness measure. Based on this measure, the BRT alternatives would be slightly more cost-effective than the LRT Alternatives, with Medium Investment BRT being the most cost-effective. The Medium Investment LRT Alternative is the most cost effective of the LRT Alternatives. This demonstrates that the added investment in providing facilities that improve the operating speed and therefore the travel time for the Medium Investment Alternative generates more benefits relative to the costs than the Low Investment Alternatives. However, the incremental costs of providing additional facilities in the High Investment Alternatives relative to the Medium Investment Alternatives generate a diminishing rate of benefits.

### ***Support economic and community development***

All alternatives except the No Build would generally support the established county master plans and the state Smart Growth policies. Only the LRT Alternatives support the Montgomery County Master Plan which calls for LRT with the permanent Capital Crescent Trail along the Georgetown Branch right-of-way. All of the Build alternatives except the Low Investment BRT would support the Montgomery County Master Plan by constructing the full final segment of the permanent Capital Crescent Trail.

The master plans of Montgomery and Prince George's County target communities and areas along the Purple Line corridor for economic and community development. They cite improved transit service and access as a supportive measure for achieving this development. For example, the Maryland-National Capital Park and Planning Commission/Redevelopment Authority of Prince George's County/City of Takoma Park *Community Development Initiatives in the University Boulevard Area* identifies the Purple Line as a supportive project for achieving this development.

All alternatives have nearly identical alignments and station locations and similar volumes of service and would support the established economic and community development plans of the counties and local jurisdictions along the corridor. Therefore, these development measures are not a differentiating factor among the alternatives.

### ***Contribute to attainment of regional air quality standards***

All BRT and LRT Alternatives would attract automobile trips to transit, reducing automobile-generated mobile-source air pollutant emissions. Transit service is more fuel efficient and less polluting than automobile travel. High Investment LRT would attract the most automobile trips to transit. The LRT Alternatives attract more automobile trips to transit than the BRT Alternatives.



## Cost-Effectiveness

The cost-effectiveness analysis is a mechanism comparing the total costs of a project to its benefits. A key measure used to determine the relative advantages of proposed transit systems is known as the cost-effectiveness index. This index is used to measure the benefits that users experience as a result of a new transit improvement, such as LRT or BRT service, compared with a TSM Alternative.

The Summary table presents the cost-effectiveness index for the alternatives. User benefits can accrue to users of fixed guideway transit services due to attributes of these systems not reflected strictly in terms of travel times and out-of-pocket costs. These are referred to as mode-specific attributes. The degree to which these additional benefits accrue to the users depends on the definitions of the alternatives, including the guideway characteristics of the transit modal technologies. These would accrue to all the BRT and LRT Alternative users to varying degrees depending on the specific attributes of the alternative. The measure is very useful in the AA/DEIS for the comparative evaluation of the alternatives to show the degree of increased user benefits for increasing level of capital and operating costs. The lower the number, the more cost-effective the alternatives under this particular method are. It is also useful for assessing the potential for New Starts funding.

### Mode-Specific Attributes

These attributes account for perceived benefits that users feel they receive for amenities, comfort, reliability, safety and other characteristics of the mode.

The results in the Summary table indicate that the BRT Alternatives are slightly more cost-effective than the LRT Alternatives, with the Medium Investment BRT Alternative being the most cost effective under this measure. Medium Investment LRT is the most cost effective of the LRT Alternatives. This demonstrates that the added investment in providing facilities that improve the operating speed and therefore the travel time for the Medium Investment Alternative generates more benefits relative to the costs. However, the incremental costs for providing additional facilities in the High Investment Alternatives relative to the Medium Investment Alternatives generate a diminishing rate of benefits.

FTA defined ranges for rating projects submitted for FTA consideration for New Starts funding. These ranges are updated occasionally to account for cost escalation and other such factors. Currently, a measure above \$30.00 per hour is rated “Low,” between \$24.00 and \$30.00 per hour is rated “Medium-Low,” between \$23.99 and \$15.50 per hour is rated “Medium,” between \$15.49 and \$12.00 is rated “Medium-High,” and under \$12.00 per hour is rate “High.” These will likely change by the time that a Purple Line Locally Preferred Alternative would be submitted to FTA for rating. All the alternatives would fall into the “Medium” range except for the Low Investment LRT which would fall into the “Medium-Low” range. For New Starts purposes at this point, an alternative should have a “Medium-Low” rating and preferably a “Medium” rating.



## **Financial Feasibility**

Considerations of financial feasibility are based on the magnitude of the overall cost of the proposed transit improvements compared to the capacity of various funding programs available to fund it. The overall costs include both initial capital costs and the on-going costs of operations and maintenance. The funding sources include fare revenue from additional riders, federal programs, such as the FTA's New Starts program, State of Maryland funding, county and other sources, including private funding.

The proposed alternatives differ significantly in both capital and operating cost, ranging from a relatively minimal cost for the TSM and Low Investment BRT Alternatives to more than \$1 billion in capital costs and significant annual operating costs for the High Investment BRT and LRT Alternatives. However, for the purposes of the AA/DEIS evaluation, all of the alternatives are potentially feasible provided that they generate sufficient transportation benefits to meet the requirements of the relevant federal and state funding programs.

## **Equity**

Equity considerations generally fall within three classes:

- The extent to which the transit investments improve transit service to various population segments, particularly those that tend to be transit-dependent
- The distribution of the cost of the alternatives across population segments through the funding mechanism used to cover the local contribution to construction and operation
- The incidence of any significant environmental effects, particularly in communities immediately adjacent to proposed facilities

As discussed below, the mobility and accessibility, economic and community development, and environmental benefits of the Purple Line alternatives generally accrue to the residents of the corridor as well as to the Washington metropolitan region, while the relatively few adverse effects are borne primarily by those persons residing in the corridor. Established regional and federal funding mechanisms will be used for construction and operation of the selected alternative, and new funding sources will be used to prevent diversion of resources (funding, service, or infrastructure) from other parts of the region.

### ***Service Equity***

All of the proposed alternatives except the No Build, and including the TSM, would improve both the travel time and the reliability of the transit service in the corridor. The proposed alternatives would function as both a line haul service connecting the major activity centers and communities along the corridor, and as a "collector-distributor" for trips using the Washington, DC area's extensive regional transit system, including the Metrorail, MARC, Metrobus, and local transit services operating in the two counties, and as an intra-corridor service for trips generated within the corridor. All alternatives would provide improved access to the corridor's



employment centers; educational facilities; health centers; and institutional, cultural, recreational, entertainment, open space, retail, and governmental resources. No one group would receive a disproportionate share of these benefits to the detriment of another group.

### ***Financial Equity***

If a Build Alternative is selected, it is expected that it would be financed by a combination of federal, state, and local funds. The existing funding structures of the MDOT/MTA, Montgomery and Prince George's Counties, and WMATA will continue to fund existing services and capital programs throughout the region. A combination of new federal, state, and local funding and, potentially, new sources of local funds, including new taxes, could be employed. The use of established federal and regional sources means no one group in the corridor or the region receives a disproportionate share of the financial burden of the capital and operating and maintenance costs relative to the benefits received. No financial equity considerations are raised by the project, either in terms of the source of subsidy or the level of fare payments required of passengers.

### ***Environmental Equity***

Expanded transit services, whether TSM, BRT, or LRT, provide environmental benefits to the region. By increasing transit use and attracting trips from automobiles, the alternatives reduce emissions and energy, although these reductions are a relatively small proportion of the regional totals. The daily reduction in automobile trips ranges from 11,400 to 20,500 for the Build alternatives. BRT and LRT are expected to better support the local plans for economic development and community development benefits to residents of the region and the corridor compared to the TSM Alternative because of the higher number of riders attracted to the service. While there are some adverse proximity effects for those communities who back on to the Georgetown Branch right-of-way purchased over two decades ago for, and designated in the *Georgetown Branch Master Plan* for a joint transitway and trail facility, and along some of the street-running surface alignments, these communities would have access to the improved transit services provided and would be among the beneficiaries of the mobility and accessibility improvements.

### **Trade Offs**

An overall assessment of how well each of the alternatives helps attain local goals and objectives involves consideration of all areas and measures described above. Moreover, it is dependent upon the relative priorities and value judgments placed on the individual items. Thus, while the AA/DEIS report provides the necessary quantitative and qualitative assessments needed as a basis for decision making, the final evaluation of performance of alternatives with respect to the attainment of local goals and objectives requires a collective analysis of the trade-offs involved in comparing relative advantages and disadvantages of the alternatives in each of the subject areas analyzed.

Transportation services and facilities connect people with their jobs, education, recreation, and other personal needs. Transportation services and facilities are essential for developing and



sustaining the economy; they shape and affect our communities and environment. Thus investments in transportation, particularly public investment in higher performing transit improvements, are intended to achieve objectives well beyond just mobility. Economic development, community development, and environmental objectives and measures must be considered along with mobility objectives when evaluating the high capacity transit alternatives for the corridor.

The No Build Alternative would leave unaddressed the mobility problems for the circumferential travel patterns to, from, and between the major activity centers, the residential communities, and the regional transit system network in the corridor, especially the Metrorail system. It leaves unaddressed the economic and community development, environmental, and master plan goals established for communities and jurisdictions along the corridor.

The TSM would address these problems to a limited degree leaving much of the needs and goals unaddressed or under-addressed.

All the BRT and LRT Alternatives address the mobility problems and needs and the economic and community development, environmental, and master plan goals established for communities and jurisdictions in the corridor. These goals would be maximized by the higher investment in LRT Alternatives and particularly the High Investment LRT Alternative. The capital cost and annual operating subsidy required for this alternative are substantial and would require a large commitment of federal, state, and local financial resources. A substantial amount of the benefits would be achieved by the Medium Investment LRT Alternative but at a lower cost. The BRT Alternatives would require lower capital and annual operating subsidy investments and commitment of financial resources, but would provide lower achievements of the mobility and other needs and objectives.

An issue generating a high degree of interest in Chevy Chase and the Columbia County Club area is the use of the Georgetown Branch railroad right-of-way along which the Interim Georgetown Branch Trail is located. The re-introduction of rail operations with the LRT Alternatives, or introduction of Medium or High Investment BRT, in conjunction with the construction of the permanent Capital Crescent Trail segment, as called for in the Montgomery County Master Plan for several decades, would remove essentially all of the trees within narrower portions of the right-of-way. The trees and vegetation on the properties abutting the right-of-way would be expected to remain and maintain much of the tree cover and visual character. The design features and character of the transitway and trail are intended to minimize the impacts. The No Build and TSM Alternatives would not use the Georgetown Branch right-of-way but as described above would not address the needs and objectives for the project. The only Build Alternative that would avoid the use of this segment of the Georgetown Branch right-of-way west of Jones Mills Road would be Low Investment BRT. In addition to shifting any concerns of operating the transit service to other communities along Jones Bridge Road, this alternative also would be the least effective Build Alternative in addressing the corridor needs and project objectives. Further, the Jones Bridge Road alignment is not in the County master plans and as such, was never subject to the public review required under the master planning process. The Low Investment BRT runs adjacent to the National Naval Medical Center, which



will be the site of growth in employment and activity from the BRAC program, nonetheless, all other Build alternatives provide comparable, if not better transit access and service in combination with existing Metrorail and bus services. The Build alternatives that use the full extent of the Georgetown Branch right-of-way are not only faster, but would also provide more reliable service.

Tunneling and other types of underground construction of the alignments require a much higher expenditure of capital funds than surface or even aerial alignments. The Build alternatives would employ tunnel sections where they would be required for topographic conditions or where they would provide operating speed improvements over surface alignments. The trade off of the higher capital cost and increased mobility benefits was discussed earlier. Tunnels or underground construction, suggested for the Georgetown Branch right-of-way as an impact avoidance measure, provide no operating speed or mobility benefits while substantially increasing the capital cost; thereby lessening the cost-effectiveness of the alternative in the FTA New Starts rating. Similar suggestions for longer tunnels in response to community concerns, specifically along Wayne Avenue, would have similar effects as the tunnel segment provides little improvement in the mobility benefits relative to the higher capital cost.

Notwithstanding the effectiveness and cost-effectiveness of the Build alternatives, the availability of state and federal capital funds may limit what could ultimately be spent for the implementation of a project in the corridor. Considerations of other transit projects in the state, other transportation, and other funding priorities, and availability of federal funds may establish an upper limit on what could be invested in the corridor. The response could involve: selecting an alternative that falls within the funding availability, implementing only a portion of an alternative (minimal operating segment or MOS) either as the full extent of the project or as an initial phase of the project with other phases implemented later; or deferring the implementation of a project until funding for the locally preferred alternative is available.

## **Where We Are in the Planning Process**

The AA/DEIS is part of the Environmental Planning Process outlined in the following graphic. Ultimately, the State of Maryland will decide which alternative (No Build, TSM or one of the Build alternatives) is the Locally Preferred Alternative for the corridor. If a Build

Alternative is chosen, MTA would prepare a Final Environmental Impact Statement (FEIS), documenting the decision, and then ultimately a Record of Decision would be issued by the FTA allowing Final Design, right-of-way acquisition, and construction activities to proceed.

## **Next Steps**

MDOT and MTA will select a Locally Preferred Alternative from among the current alternatives and options. The State of Maryland will consider information contained in the AA/DEIS, available funding, and public comments received during the AA/DEIS comment period in making their decision. When the preferred alternative is chosen, operational and construction effects will be further evaluated and included in the Final EIS.

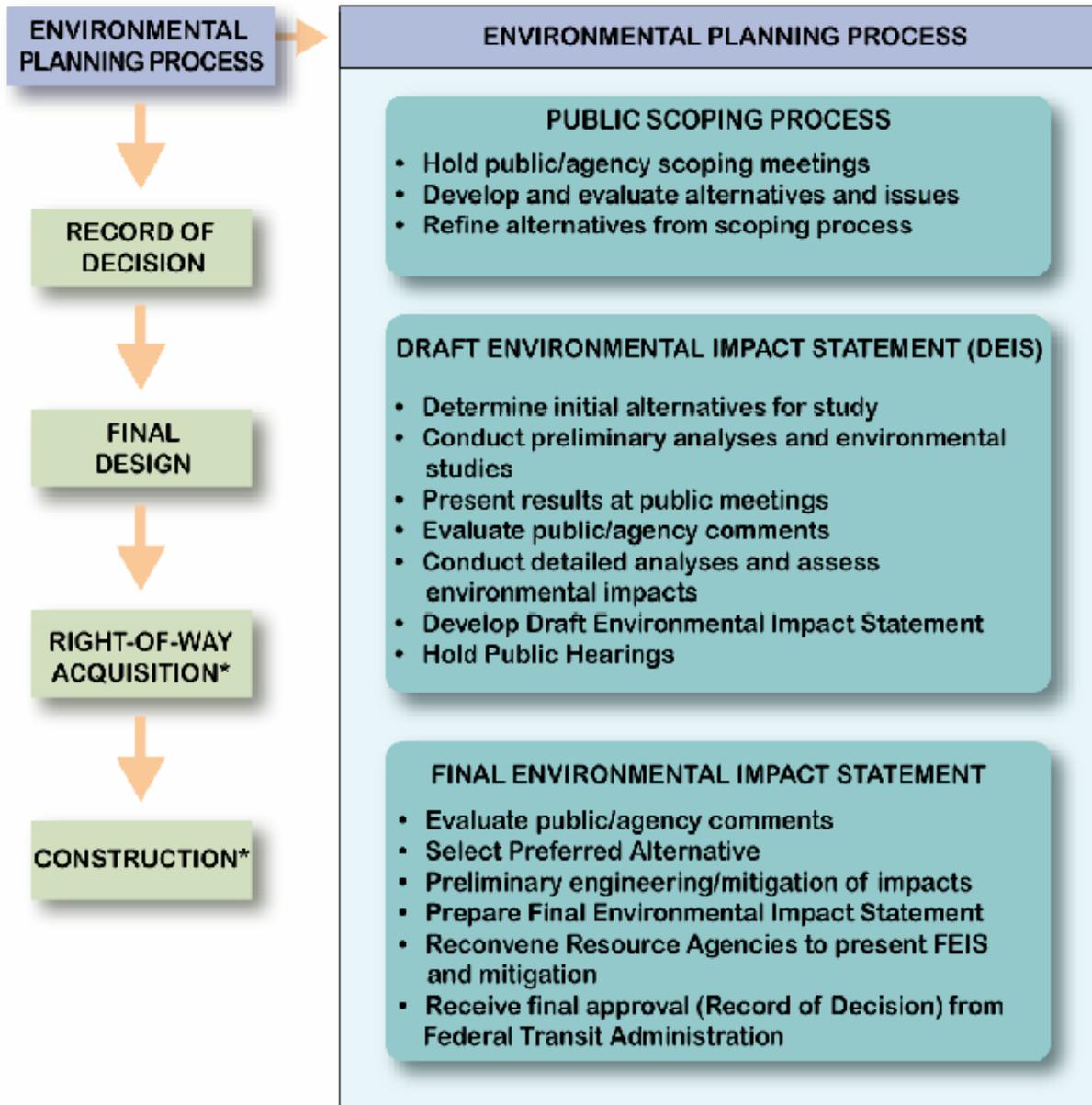


The information presented in the AA/DEIS will be made available to the public and agencies for review and comment in the August-September 2008 time frame. A series of public hearings will be held at several locations in the Purple Line corridor to provide an opportunity for the public to submit comments on the document and input to the decision on selecting the Locally Preferred Alternative. In response to a request from the public, an extended 90-day circulation and comment period will be provided.

The State of Maryland will review the public and agency comments, and in consultation with the counties, local jurisdictions, elected officials, and involved transit providers, make a decision on a Locally Preferred Alternative. The decision will identify the transit mode and the level of investment, recognizing the No Build and TSM Alternatives are among the choices for the decision makers. Based on comments and review of the technical results, some refinement of the selected alternative may involve decisions on any design options and incorporation of certain features from other alternatives. Considerations by the State of Maryland with regard to the Corridor Cities Transitway Corridor and the Baltimore Red Line Corridor, as well as other transportation priorities, may affect the phasing and timing of the Locally Preferred Alternative implementation.

In spring 2009, the MTA expects to submit a New Starts Criteria package for the Purple Line Locally Preferred Alternative to the FTA. Once FTA rates the project, and assuming a recommended rating, MTA will submit a Request to Initiate Preliminary Engineering to the FTA.

During Preliminary Engineering, the Locally Preferred Alternative will be further developed, technical and community and natural environmental impact assessments and mitigation measures further refined, and an implementation plan developed. During Preliminary Engineering, the FEIS will be prepared and circulated for comments. The FEIS will include responses to comments submitted on the AA/DEIS, as well as commitments on mitigation and required resource permits. Following the review of FEIS comments, FTA would issue a Record of Decision completing the federal environmental review process.



\* Project Status Dependent on Funding