# THE GEORGIA AVENUE BUSWAY STUDY

## TECHNICAL REPORT


The Maryland-National Capital Park and Planning Commission

assisted by
Parsons Brinckerhoff Quade & Douglas
Loiderman Associates
The AE Group
Rhodeside and Harwell

April 1999

# *Abstract*

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| **Author** | The Maryland-National Capital Park and Planning Commission<br>Montgomery County Department of Park and Planning<br>Countywide Planning Division --Transportation Planning |
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| **Abstract** | This report contains technical documentation from the Georgia Avenue Busway Study, which evaluated the feasibility of providing a busway on Georgia Avenue between the Glenmont and Olney areas of Montgomery County. A separately bound Summary Report is also available. |

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# TECHNICAL REPORT

## Introduction

In response to the increasing travel demand on Georgia Avenue, the Maryland-National Capital Park and Planning Commission (M-NCPPC) has completed a study to evaluate the feasibility of a busway along Georgia Avenue (MD 97), between the Glenmont Metrorail station and the community of Olney. This Technical Report describes the extensive analytical work that was performed during the study. In addition to this report, M-NCPPC has prepared a Summary Report, which provides a concise overview of the study results. The Summary Report can be obtained from Transportation Planning by calling 301-495-4525.

Having commenced in the fall of 1996, the Georgia Avenue Busway Study has involved a work effort of approximately a year and a half. The study has been performed under the direction of the Transportation Planning Unit of the County-wide Planning Division. A consultant team, headed by the firm of Parsons Brinckerhoff Quade & Douglas, Inc., has provided technical assistance throughout the course of the study. During this period, the consultant team performed considerable planning and design work as well as supporting staff in a major outreach effort to obtain input and feedback from other agencies and the surrounding community.

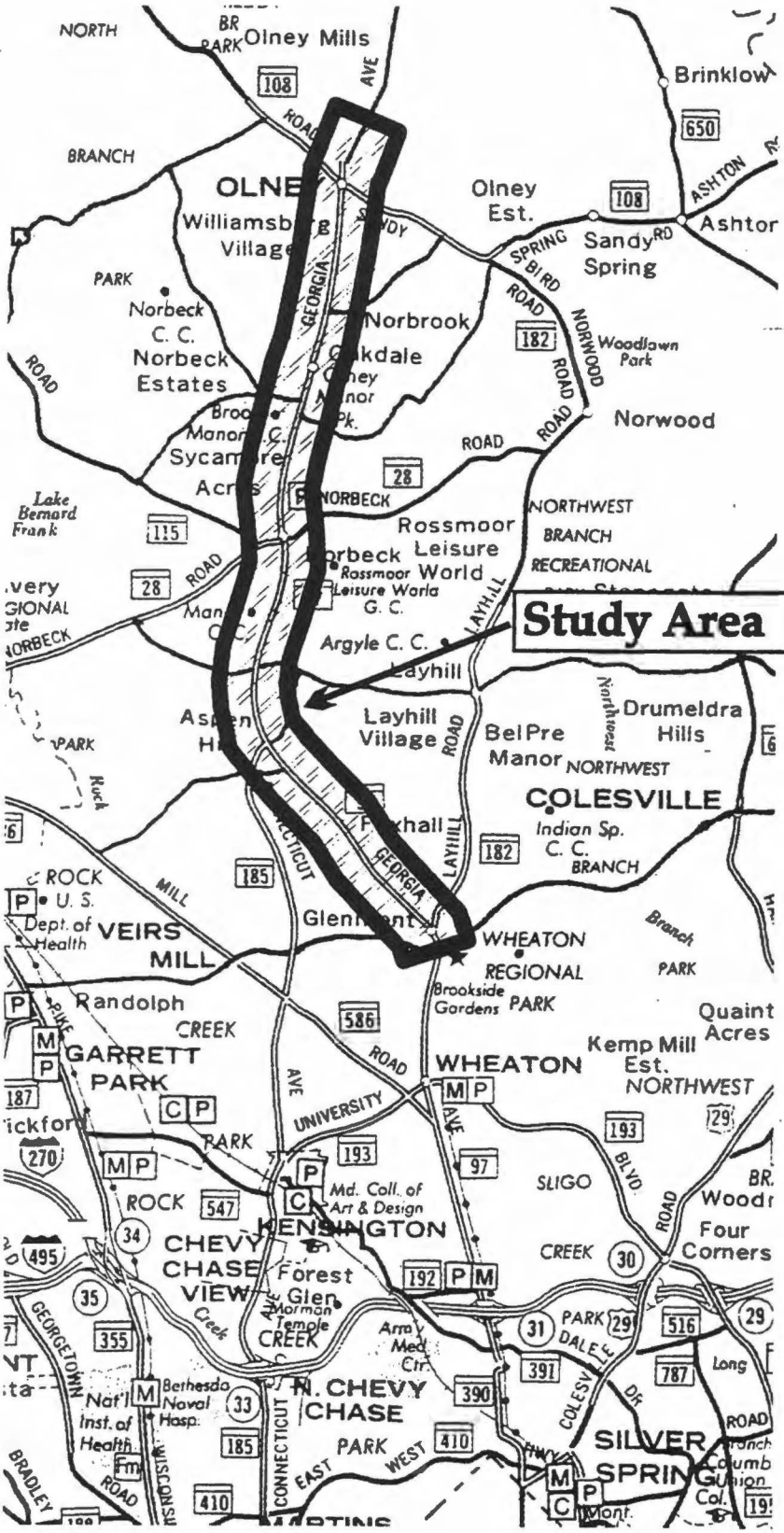
The study area for a potential busway on Georgia Avenue, as shown in **Figure 1**, is approximately nine miles long. It encompasses existing Georgia Avenue, a divided road classified as a major highway that has an average right-of-way width of approximately 150 feet. The right-of-way width varies from about 100 feet at Matthew Henson State Park to 250 feet immediately north and south of Norbeck Road. The road segment south of the Norbeck Road intersection generally has three through lanes in each direction while the segment north of the intersection generally has two through lanes in each direction. The adjoining land uses in much of the area are moderate density residential, with clusters of commercial development primarily at the southern end in Glenmont, the northern end in Olney, and at the Connecticut Avenue intersection.

There is considerable room for improvement in the way Georgia Avenue looks and functions. The aesthetic quality of the road is only fair. The median and edges of the right-of-way for much of the distance typically lack trees, shrubs, and other landscaping features. The only park-and-ride facility in the area is at the Norbeck Road intersection. It is hidden behind a berm and is not used by commuters to any large extent, primarily due to safety concerns. Pedestrians and cyclists in the area face frequent difficulties when they attempt to cross at wide intersections and use sidewalks that are uncomfortably close to the curbs and heavy flows of traffic.

Georgia Avenue is a major road that many people live near and depend on day-to-day in the Olney, Aspen Hill, and Wheaton areas. That is why improving the performance and appearance of this road is so important. Even though there have been major public investments in widening road segments and expanding many intersections on Georgia Avenue, commuters at some locations continue to experience significant levels of delay during peak traffic hours. Georgia Avenue's key intersections at Connecticut Avenue, Bel Pre Road, and Norbeck Road are currently experiencing Level of Service F conditions during peak traffic periods. Its intersections at Layhill Road and MD 108 are, in general, somewhat less congested. If no other actions are taken, growth in traffic will cause highly congested conditions at these locations in the not too distant future. The analyses performed by the Georgia Avenue Busway Study confirm previous forecasts of many more Level of Service F conditions on Georgia Avenue in the years ahead. Level of Service F indicates congested traffic conditions and, under the more severe conditions, can mean frequent delays and waits through two or more signal cycles.

Road widenings and turn lane additions have been the solution of choice for many years; but, there are practical limits to further widenings on Georgia Avenue due to social, environmental, and financial constraints. Further widenings would

**FIGURE 1: Study Area Map**



make Georgia Avenue an even more difficult road for pedestrians to cross, would bring traffic closer to residents' yards, and would not be cost-effective when congestion relief is anticipated to last only a few years.

Previous transportation studies have made it clear that it is becoming less and less feasible to increase the car-carrying capacity of Georgia Avenue, and that there needs to be more emphasis on increasing the people-carrying capacity of this major road. A key to improving the efficiency of Georgia Avenue is to offer people in the area better alternatives to driving by making public transportation a much more appealing choice. That is why this study has examined the feasibility of establishing exclusive lanes for buses on a busway, thereby substantially improving bus service and making transit a more viable option for people traveling on Georgia Avenue.

Even though there is currently frequent bus service along Georgia Avenue, a large proportion of people in the area rely on their automobiles to get to their destinations. It is no wonder that this occurs. Compared with automobiles, buses are less convenient, make many stops along the way, and get stuck in the same traffic as motorists. The net result is that it takes a person about twice as long to ride a bus from Silver Spring to Olney as it does to drive a car during the evening peak hours.

Previous studies of Georgia Avenue have highlighted the need to plan ahead for future travel demands and provide quality transportation choices for people in the area. These studies have concluded that improving transit facilities and services on Georgia Avenue is essential. A busway is the best way to respond to the need for better transit service in this area, according to M-NCPPC's *Alternatives Report of the Transitway & High-Occupancy Vehicle Network Master Plan*, which was completed in 1995. The *1994 Aspen Hill Master Plan* and *1997 Sector Plan for the Glenmont Transit Impact Area and Vicinity* also recommend a busway on the portion of Georgia Avenue under study.

This study area has also been the focus of transportation analyses by the Maryland Department of Transportation (MDOT). The Georgia Avenue area was analyzed as part of MDOT's *Study of the Appropriateness and Applicability of Light Rail Transit in Maryland* in 1988 and MDOT's *Statewide Commuter Assistance Study* in 1990. These studies also concluded that a busway is the most appropriate transit mode for this portion of Georgia Avenue. This conclusion was reached after investigating the level of transit demand and the nature of the land uses in the area. Since this portion of the County generally has moderate density residential and commercial development, it can be served most cost-effectively with buses. Additionally, unlike fixed-rail transit, buses have the flexibility to leave the busway and circulate through the residential areas to pick up and drop off passengers close to their homes.

A busway on Georgia Avenue would serve a dual transportation objective. It would help satisfy the growing need for high quality suburb-to-suburb transit service and also for a vital link to the radial Metrorail service that connects the study area with Silver Spring, Washington, DC and other parts of the region. Also, the busway would be a catalyst for a major upgrade in the amenities along Georgia Avenue by enhancing pedestrian and cyclist safety through the creation of an attractive tree-lined boulevard with linear pathways. This is consistent with the "green corridor" concept proposed for Georgia Avenue in the *1989 Master Plan for the Communities of Kensington-Wheaton*, the *1994 Aspen Hill Master Plan*, and the *1997 Sector Plan for the Glenmont Transit Impact Area*.

## Study Purpose

The primary purpose of this study was to:

1. Perform a comprehensive evaluation of the feasibility of providing and operating a busway on Georgia Avenue.

2. Identify ways to enhance the appearance, safety, and livability of the study area.

3. Examine aspects of a proposed busway in sufficient detail to determine whether additional right-of-way needs protection in area master plans.

## Overall Findings

**Consistent with the results of previous studies and plans, this study has confirmed that a busway between Glenmont and Olney is needed and has found that a busway in this study area is feasible.** From a technical standpoint, no fatal flaws were found that would prevent a busway from succeeding in this area. The major findings are as follows:

1. Projected transit demand justifies a two-lane bi-directional busway in the median, accommodating both express and local bus service.

2. The market area is sufficient to warrant a supporting network of approximately six new express bus routes, with buses operating at intervals of 15 minutes on each route.

3. Extensive landscaping and amenities, including trees, grass strips, sidewalks, hiker/biker trails, bus shelters, and improved park-and-ride facilities, are considered essential for this type of facility in order to significantly enhance the appearance, safety and livability of the study area.

4. Improved landscaping, which is sensitive to the need to enhance the quality of the communities that the busway would serve, would result in using more of the existing or protected right-of-way than would otherwise occur.

5. At this time, there does not appear to be a need to protect additional land for right-of-way along Georgia Avenue for the busway; much of the necessary right-of-way either already exists or is protected in area master plans. However, any intersection improvements proposed for the roadway must not use up much of the existing right-of-way because the feasibility of implementing the future busway and the associated landscaping and amenities is highly dependent on utilizing this right-of-way.

## Planning Board Action and Next Steps

At its meeting on June 4, 1998, the Planning Board accepted the Summary Report and endorsed inclusion of a preferred busway concept (described later in this report) as a potential transit project in staff's ongoing Transportation Policy Report.

The next steps in the planning process for the busway are as follows:

1. When staff completes the Transportation Policy Report, the Planning Board will assess the level of priority of a Georgia Avenue busway relative to all of the other potential transitway and HOV facilities that may be desirable in the County.

2. If the Planning Board determines that the Georgia Avenue busway is a high priority project and deserves to advance further, the Board may take actions such as recommending that the County Council, County Executive, State Delegation, and Maryland Department of Transportation support an MDOT-sponsored project planning study for the busway.

3. Proposals for the busway and the ancillary facilities should be included in future revisions to the relevant area master plans, as appropriate.

## Scope of Work

To fulfill the purposes of the study, the consultant team, which was led by Parsons Brinckerhoff Quade & Douglas, Inc., assisted M-NCPPC staff in accomplishing the following general tasks:

1. Evaluate the reasonableness of existing and future transportation network assumptions and travel demand figures for the Georgia Avenue area.

2. Prepare maps, designs, and cost estimates of potential busway options.

3. Analyze the impacts of the various busway options on bus passengers, bus operations, traffic operations, and the surrounding communities and suggest ways to produce as many positive impacts as possible.

4. Involve the community and other agencies throughout the planning process by conducting focus group worksessions with residents and business people, holding a public workshop, preparing presentation materials for staff briefings with civic organizations and business groups, and meeting monthly with members of the Study's Technical Advisory Committee. The Technical Advisory Committee is described in a later section of this report.

The specific tasks in the study's scope of work included:

**Task 1: Background Information**

Accumulate as much information about the characteristics of the study area as possible to use as a basis for subsequent work in the study.

**Task 2: Current and Projected Traffic Conditions and Transit Ridership**

Assess the reasonableness of the existing and future transportation network and travel demand assumptions, estimates, and projections.

**Task 3: Input from Agencies and Citizens, and Status Report to the Planning Board**

Obtain input from staff members of other agencies through meetings of the study's Technical Advisory Committee and from citizens through meetings with community associations, business groups, and the initial focus groups to help define transportation needs and identify potential solutions. Present the results to the Planning Board.

**Task 4: Preparation of Maps and Cross Sections of Busway Options**

Prepare base maps of the study area and superimpose the possible right-of-way and alignment for each busway option. Prepare cross-section details and associated elements such as bus service alternatives.

**Task 5: Evaluation of Impacts of Busway Options and Preparation of a Draft Busway Concept**

Evaluate the options prepared in Task 4 from the standpoint of general transportation, environmental, social, aesthetic, and financial impacts. Based on analyses of the study team and previous input from staff members of other agencies and citizens, prepare a draft busway concept.

**Task 6: Feedback from Agencies and Citizens on Potential Busway Options**

Provide descriptions and evaluation results of the busway options and the preferred busway concept to staff members of other agencies on the study's Technical Advisory committee, as well as to citizens in community associations, business groups, and follow-up focus groups. Obtain additional feedback at a public worksession and a public briefing. Based on this feedback and further analyses by the study team, prepare a preferred busway concept.

**Task 7: Presentation of Draft Summary Report to Planning Board**

Assist staff in preparing a Summary Report that includes the study purpose, findings, the preferred busway option, descriptions of the busway options, and explanation of various aspects of the preferred busway concept. Assist staff in making modifications to the preferred busway concept as a result of direction from the Planning Board.

**Task 8: Prepare Final Summary Report and Technical Report**

Assist staff in the preparation of the Final Summary Report and a more detailed Technical Report.

## Transit Alternatives

The study considered four busway options and one light rail option. Typical sections including proposed dimensions for each option are shown in **Appendix A**. In the analysis, the four options for providing exclusive lanes for buses were:

1. Center busway
2. Curb-side busway
3. Median-side busway
4. Contraflow busway

Several variations of the above busway options were examined. Two variations of the center busway option -- a one-lane reversible busway and a two-lane bi-directional busway -- were examined. Three variations for creating bus lanes were examined for the curb-side and median-side busway options -- either adding a lane or taking an existing general purpose lane along the entire length of the busway, or blending the two by taking a travel lane south of Norbeck Road while adding a lane north of Norbeck Road. This "combination" variation would make optimum use of available right-of-way and make Georgia Avenue's cross-section uniform throughout the length of the study area. In general, Georgia Avenue currently has six lanes south of Norbeck Road and four lanes north of Norbeck Road.

All busway options would be served by a network of feeder bus routes using small buses, such as 21-passenger vehicles that are currently available. These small buses would circulate on neighborhood streets to collect and distribute passengers and operate on the busway for the express portion of the trips. The express bus network is described in more detail in a later section of this report. Under the Planning Board's preferred busway concept, transit users would also have access to the express buses at a new park-and-ride lot near the Longwood Recreation Center, an enhanced park-and-ride lot at Norbeck Road, and a bus and taxi lot at the Glenmont Metrorail Station. The two-lane center busway option has the added advantage of accommodating local buses as well as express buses. This option would provide local bus stops with shelters in the median rather than along the edge of Georgia Avenue.

**An essential part of the preferred busway concept is to improve the appearance, safety, and livability of the study area through enhanced landscaping and streetscaping in the right-of-way.** Accordingly, each busway option includes grass strips and planting areas for trees and/or shrubs in the median and along both sides of the road. In addition, each option accommodates bicycle and pedestrian traffic on a system of continuous sidewalks and hiker/biker paths separated from the roadway by tree panels. The study considered the alternative of wider curb lanes on Georgia Avenue to accommodate both bicycles and motor vehicles side by side on the roadway surface. However, because such an alternative would not only require more pavement and right-of-way width but also raise a serious safety issue of bicyclists trying to travel on the edge of a heavily-traveled road, it was not endorsed by the study's Technical Advisory Committee. While the Committee did not challenge the general policy, it felt that Georgia Avenue should, for the reasons cited, be an exception to that policy.

## Preferred Busway Option

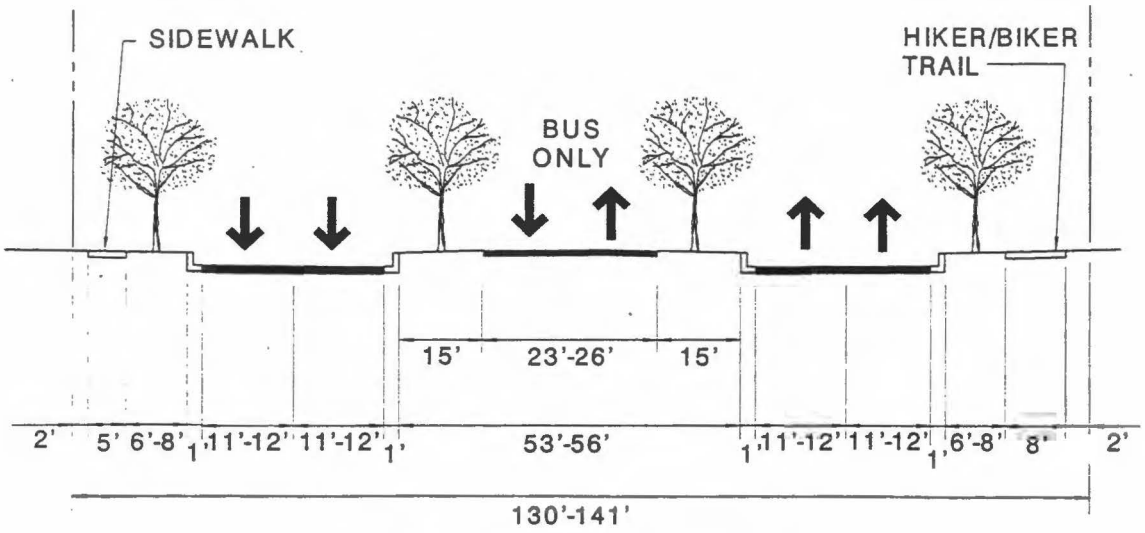
**Center Busway**
(Two-lane Bi-directional)

After weighing all the advantages and disadvantages of each option, **the Planning Board's preferred option is adding a two-lane bi-directional busway in the median. This busway would accommodate both express and local bus service.**

The length of the busway would be approximately seven miles, extending from Glenallan Avenue at the southern end to Spartan Road at the northern end of the busway. The Planning Board's preferred busway option includes accommodating existing local bus

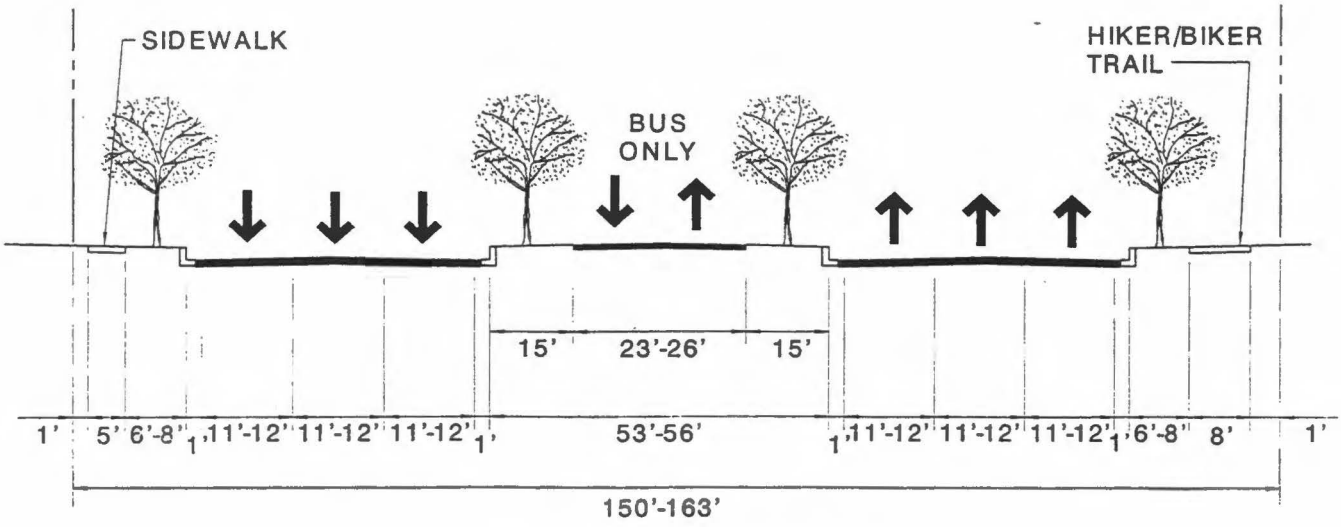


**FIGURE 2: Preferred Busway Option Cross Sections**




## CENTER BUSWAY

(NORTH OF NORBECK ROAD)




## CENTER BUSWAY

(SOUTH OF NORBECK ROAD)

Note: The 15' landscaped areas in the median would narrow to 5' to allow for a left-turn lane at certain intersections.

service as well as a new feeder bus network that would use the busway. Metrobus and Ride-One bus routes would no longer operate in the curbside, general purpose lanes. They would operate in the center busway, stopping at bus shelters in the landscaped areas of the median. In addition to current local bus services, the feeder buses would operate in the busway as part of a possible network of six routes, using small buses operating at intervals of 15 minutes on each route. In the mornings, for example, a small bus would circulate on local streets in neighborhoods to pick up passengers at bus stops near their homes and then enter the busway and continue southbound for an express trip toward Glenmont. Passengers would stay on the same bus for the entire trip. Once the feeder bus enters the busway, the only stop for the express service between Olney and Glenmont could be at the Norbeck Road intersection or off-line at an improved Norbeck Road Park-and-Ride Lot. The best location for that stop will be determined later during the project planning study.

The center busway option received by far the most favorable comments from both the technical staffs and community participants. Both the technical staffs and citizens indicated that a major advantage of the center busway option is that it does not negatively affect the general purpose lanes. In fact, more capacity would become available in the general purpose lanes since local buses would travel in the busway lanes rather than in the existing general purpose curbside lanes.

Also, this option provides the greatest amount of service to the most people because the center busway would serve both express and local bus passengers and offer them access at bus stops along the entire length of the study area. Passengers could board and alight express buses in the neighborhoods and park-and-ride lots and also local buses at stops in the median during the entire day. To use the local buses for any trip, people would only have to cross half of Georgia Avenue to reach the bus shelters in the protected median.

Another major advantage of this option is that it provides a barrier separated busway. This allows the busway to operate without the potential for interruptions from adjacent parallel traffic flow, thereby increasing its safety and operational efficiency.

This option makes efficient use of the existing median, especially in the ample space available in the median of most of the northern segment of Georgia Avenue, and allows for attractive sections of greenery between the pavement areas along the entire busway. The intent of this option as well as the other options is to offset the impact of new paving for the busway lanes by substantial landscaping in the median as well as along the curbs. The net effect would be a much more aesthetically pleasing environment than currently exists along Georgia Avenue.

**Figure 2** shows the Planning Board's preferred cross sections for the busway. The upper cross section shows a typical mid-block four-lane segment of Georgia Avenue north of Norbeck Road. It specifies a range of minimum to desirable right-of-way widths that are well within 150 feet. The lower cross section, meanwhile, shows a typical mid-block six-lane segment south of Norbeck Road. For this segment, a width of 150 feet, which is the minimum value in the range of possible right-of-way widths, is preferred in order to minimize encroachments on adjacent properties.

It is very fortunate that for much of the distance on Georgia Avenue between Glenmont and Olney, a 150-foot right-of-way width either already exists or is protected in area master plans. The Olney Master Plan and Aspen Hill Master Plan already specify protection of 150 feet of right-of-way on Georgia Avenue. Although the Kensington-Wheaton Master Plan calls for a minimum of 135-145 feet, approximately 150 feet already exists for nearly all of the distance in question. A few right-of-way constraints occur primarily at the southern and northern ends of the busway alignment. At those locations, the choices are either to maintain the preferred 150-foot right-of-way and encroach upon some properties or to compromise on one or more elements of the suggested cross section to make it fit within the available right-of-way. These trade-offs and associated engineering details are best examined and resolved in the subsequent project planning phase of this project.

While sufficient right-of-way either already exists or is protected, substantial reconstruction of existing Georgia Avenue would be needed to fit the suggested cross section elements within the bounds of the available right-of-way. With careful design, it appears that the taking of adjacent property could be minimized or avoided altogether for much of the busway alignment. It should be noted, however, that the provision of grading easements and their incremental effects were not examined as part of this study. A more detailed project planning study would determine such impacts.

The total capital costs associated with roadway reconstruction are estimated to be in the range of $52-58 million. At the higher end of this range, total costs would include extensive relocation of the existing curbs, utilities, and pavement on Georgia Avenue in order to fit the suggested cross section within a 150-foot right-of-way and avoid encroachments on adjacent properties. Total costs on the lower end of the range reflect an alternative approach that entails constructing the suggested cross section in such a way as to preserve as much of the existing road centerline, curbs, utilities, and pavement as possible. This alternative would require, however, considerably more encroachments onto adjacent properties because a wider right-of-way would be needed to accommodate the additional landscaping features and amenities. The bus vehicle costs and the operations and maintenance costs are discussed in a later section of this report.

## Evaluation of Transit Alternatives

In addition to the two-lane bi-directional center busway, the study evaluated an array of other transit alternatives which included:

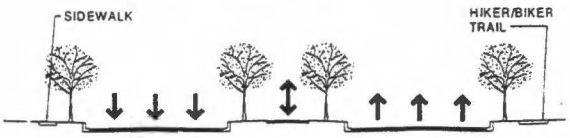
- Center Busway (one-lane reversible)
- Curb-side Busway
- Median-side Busway
- Contraflow Busway
- Light Rail Transit

Each alternative is described and evaluated below. It is important to note that the section on local impacts refers to two issues -- first, the right-of-way's potential encroachment on adjacent properties and second, the impact on community accessibility, such as the effects on driveway access. Also, approximate capital costs for each busway option are shown as a range, recognizing that more precise estimates will not be possible until the project moves forward through the project development process. These costs include project planning, preliminary engineering, right-of-way acquisition, and construction costs. The dimensions of the right-of-way elements for each option are shown in **Figure A-1** of **Appendix A.**

The consultant team assembled additional information regarding issues associated with the busway options and their positive and negative attributes. The study's Technical Advisory Committee examined this information and then reached a consensus on assigning numeric ratings to each busway option's issues. A composite rating of all issues for each option was not calculated because of the difficulty of determining relative weights of importance for each issue. The results of this evaluation are shown in the Recommendation Matrix in **Appendix B.**

### Center Busway
(One-lane Reversible)

An alternative to the two-lane bi-directional busway consists of a one-lane reversible busway that would handle southbound bus service in the morning and northbound bus service in the evening. The busway lane would be built in the existing median of Georgia Avenue. The cross-section would allow for planting areas between the bus lane and the general purpose lanes. The busway would accommodate express bus service only. Under this alternative, however, sufficient space would be provided to allow future generations to expand the busway to two lanes or install light rail in the median. The potential right-of-way width varies from 130 feet to 163 feet depending on the design standards used and the number of general purpose lanes in place. To the extent possible, this option would be constructed in such a way as to fit within a right-of-way of 150 feet. The busway location is illustrated in Typical Section 1. A more detailed typical cross-section for this option is shown in **Figure A-2** of **Appendix A.**




**Typical Section 1: Center Busway**

**Passenger Access**. To gain access to the one-lane center busway, passengers would board and alight express feeder buses in the neighborhoods or at park-and-ride lots. An intermediate stop would be at the Norbeck Road Park-and-Ride Lot. Express buses traveling in the peak direction (southbound in the morning and northbound in the evening) would use the busway, whereas those traveling in the off-peak direction would use the general purpose lanes.

**Bus Operations.** This option provides a dedicated lane only for the peak direction. Both local and express service could be provided in the peak direction with the addition of bus pull-offs. These pull-offs allow the express service to bypass the local service at stops. The buses returning in the off-peak direction are subject to general purpose lane conditions.

This busway option is physically separated from general purpose traffic by planting areas. This minimizes the potential interruption by general traffic.

**Traffic Operations.** The traffic operations most affected by a center busway are left turning movements and cross street movements. Unique signal operations will be required to allow buses and traffic to safely move through signalized intersections. Additional signing and access control will be needed to deter general purpose traffic from entering the busway. Additional pedestrian signals and crossing may be required to provide safe mid-block pedestrian movements.

**Local Impacts.** The primary local impact is associated with potential additional right-of-way needs. If local service is to be provided in the center busway, pull-off areas are required to allow express service to bypass local service. The pull-offs require additional room, which in turn potentially means needing more right-of-way.

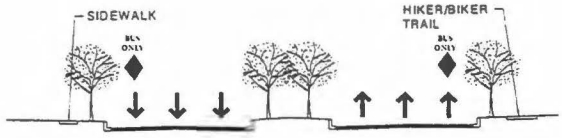
**Cost Estimates.** The following estimate is only for the capital costs associated with the roadway reconstruction. The bus vehicle costs as well as the operations and maintenance (O&M) costs are discussed in a later section of this report.

**Capital Cost Estimate:** $47 to $52 million

### Curb-Side Busway

This option, which provides a busway in the lane immediately adjacent to the outside curb, has several variations. An exclusive bus lane could be implemented either by taking the existing curb-side lane or by adding a lane to Georgia Avenue for the entire length of the busway.

This busway option accommodates both express bus and local bus service. The landscape and streetscape elements are provided within the existing median and along the outside edge of Georgia Avenue. As shown in the typical cross section for this option in **Figure A-3** of the **Appendix A**, the potential right-of-way width varies from 93 feet to 153 feet depending on the design standards used and the number of general purpose lanes in place. An additional 22 feet would be needed to provide for occasional bus pull-offs. The busway location is illustrated in Typical Section 2.




**Typical Section 2: Curb-Side Busway**

**Passenger Access.** This option is the most like conventional bus access. Since the busway is in the curb-side lane, passengers would board buses at stops similar to those that exist. Additional bus access is provided by bus stops in neighborhoods and at park- and-ride lots.

**Bus Operations.** This option provides a dedicated lane in both directions for bus service. Both local and express bus service can be accommodated if bus pull-offs are provided at curb stops. This allows express buses to pass local buses that have stopped.

The busway is not physically separated from the general purpose lanes. Therefore, enforcement of the exclusive bus lanes would be a significant problem. Bus service could be interrupted by motorists violating the busway lane restrictions as well as those making right turns. Additionally, the bus lane is subject to interference by vehicles entering and exiting local businesses and residences.

**Traffic Operations.** The primary impact to traffic operations is associated with converting a lane in each direction to provide the busway lanes. The taking of general purpose lanes has significant impacts on the capability of Georgia Avenue to handle projected traffic volumes. M-NCPPC staff estimates that the taking of a lane in each direction would increase delay of vehicles in the remaining lanes by up to 60%. As stated above, there would be auto-bus conflicts associated with motorists making right turns as well as access into residential and commercial driveways. The severity of these conflicts is dependent on the times of the busway operations. During off-peak times, buses would operate less frequently resulting in fewer conflicts.

**Local Impacts**. Taking a lane in each direction would cause increased congestion on Georgia Avenue and worsen accessibility to residences and businesses. Adding a lane in each direction, meanwhile, would require more right-of-way and possible encroachment into adjacent properties.

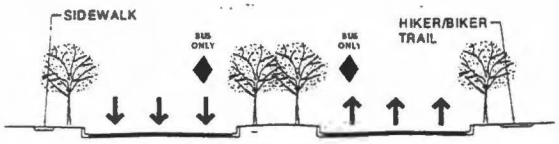
**Cost Estimates**. The following estimate is only for the capital costs associated with construction. The bus vehicle purchase costs as well as the bus-related operations and maintenance (O&M) costs are discussed in a later section of this report.

**Capital Cost Estimate:**

| | |
|---|---|
| Variation #1: Add-a-Lane | $47 - 52 million |
| Variation #2: Take-a-Lane | $14 - 16 million |
| Variation #3: Combination | $29 - 33 million |

### Median-Side Busway

This option provides a busway in the lane immediately adjacent to the median. This could be accomplished either by converting the existing median-side lanes or by adding a lane to Georgia Avenue. This busway option accommodates express service only. The local bus service would continue as it exists today in a general purpose lane next to the outside curb. Under this option, it would be unsafe and impractical for the busway to serve local buses because the entry/exit doors of the buses in the median-side bus lanes would face the traffic in the general purpose lanes rather than the curbs. Likewise, it would be unsafe for local buses to continually leave the median-side lane and weave across general purpose lanes to load/unload passengers at the local stops on the outer edge of Georgia Avenue. It would be unreasonable to expect buses to weave back and forth within the short distances between local stops. The potential right-of-way width varies from 93 feet to 153 feet depending on the design standards used and the number of general purpose lanes. The busway location is illustrated in Typical Section 3. The typical cross-section for this option is shown in **Figure A-4** of the **Appendix A.**




**Typical Section 3: Median-Side Busway**

**Passenger Access.** Since the busway would serve express buses only, passengers would only be able to access the facility by boarding at park-and-ride lots at stops in neighborhoods served by the express feeder bus network. Local bus service would continue to use the general purpose lanes and local bus passengers would board and alight at existing curb-side bus stops.

**Bus Operations.** This option provides a dedicated lane in both directions for bus service. However, only express service can be provided due to the busway lane's location next to the median. Local bus service would not benefit from this configuration. The busway is not physically separated from the general purpose lanes. Therefore, conflicts with the bus service could occur due to motorists violating the busway lane restrictions as well as those making left turns.

**Traffic Operations.** The primary impact to traffic operations is associated with taking a lane to provide the busway. Converting a general purpose lane has significant impacts on the capability of Georgia Avenue to handle projected traffic volumes. Similar to the curb-side bus option, there is the potential for bus operations to hinder motorists' turning movements. In this case, motorists making left turns would have to cross the busway to complete their turning movements.

**Local Impacts.** The primary impact on the local community is associated with adding or taking of a general purpose lane. Additional right-of-way and encroachment on adjacent properties could be required to add lanes for a busway. Taking a lane, meanwhile, would increase congestion on Georgia Avenue and negatively affect access to residences and businesses.

**Cost Estimates.** The following estimate is only for the capital costs associated with construction. The bus vehicle purchase costs as well as the bus-related operations and maintenance (O&M) costs are discussed in a later section of this report.

**Capital Cost Estimate:**

| | |
|---|---|
| Variation #1: Add-a-Lane | $47 - 52 million |
| Variation #2: Take-a-Lane | $14 - 16 million |
| Variation #3: Combination | $29 - 33 million |

### Contraflow Busway

This option provides a busway by taking the lane immediately adjacent to the median from the off-peak direction and converting it to flow in the peak demand direction. The lane would be separated from the remaining general purpose lanes by means of a physical barrier -- either a jersey style barrier or traffic cones. This option requires a significant set-up operation that would occur twice a day. One possibility is to use a machine commonly referred to as the "zipper" to place specially designed concrete barriers between the bus lane and the general purpose lanes. This is shown in **Photos 1 and 2.**

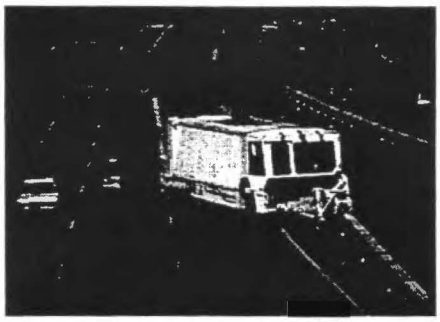


Photo 1: Zipper Machine

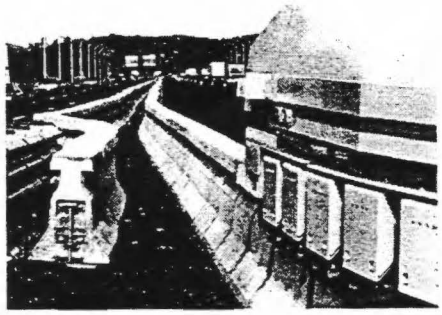
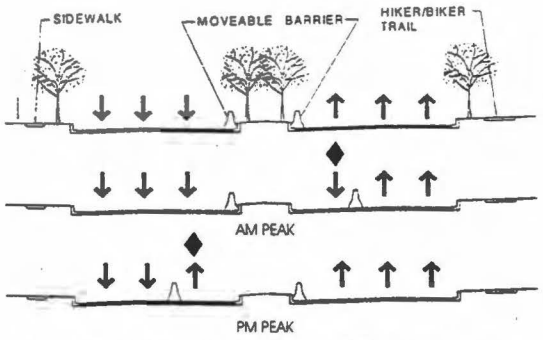


Photo 1: Interlocking Barrier

The recommended right-of-way width varies from 97 feet to 133 feet depending on the design standards used and the number of general purpose lanes. The busway locations are illustrated in Typical Section 4. A more detailed typical cross-section for this option is shown in **Figure A-5** of the **Appendix A**.




**Typical Section 4: Contraflow Busway**

**Passenger Access.** Since the buses using the contraflow lanes would offer express service only, passengers would only be able to access the busway by boarding at park-and-ride lots or at stops in neighborhoods served by the express feeder bus network. Local bus service would continue to use the general purpose lanes. There

is a possibility of accommodating local service in the busway, however passenger access would need to be provided in the median, similar to access for the center busway option, and median pull-offs would be required to allow the express buses to pass the local buses.

**Bus Operations.** This option provides a dedicated bus lane in the peak direction only. The buses returning in the off-peak direction are subject to general purpose lane conditions.

**Traffic Operations.** The traffic movements most affected by a contraflow busway are left turning movements and cross street movements. Unique signal operations would be required to allow buses and motorists to safely move through signalized intersections. Additional signing and access controls would be needed to deter general purpose traffic from entering the busway. Additional pedestrian signals and crossing may also be required to provide safe mid-block pedestrian movements. Due to the complexity of the traffic operations, some median breaks may be closed permanently or temporarily during peak hour operations. Traffic in the off-peak direction is affected by the reduction of capacity caused by the taking of a lane from this direction. Since traffic volumes are expected to grow in the off-peak direction, greater congestion in the remaining lanes in the off-peak direction are likely to occur.

**Local Impacts**. The local impacts of the contra-flow option are greater from an operations perspective than from a physical one. By using the existing pavement, the need for additional right-of-way is minimized. However, given this option's complex operational characteristics, the local residents and business people would be affected substantially. Access into and out of residential and business parking areas would be complicated during the peak period operations.

**Cost Estimates**. The following estimate is only for the capital costs associated with the roadway reconstruction. The bus vehicle costs as well as the operations and maintenance (O&M) costs are discussed in a later section of this report.

**Capital Cost Estimate:** $20 - 22 million

**Light Rail Transit**

As shown in **Figure A-6** of **Appendix A**, the light rail transit alternative consists of a two-track system in the median of Georgia Avenue. This alternative, however, was not carried forward since the study team concluded that the projections of travel patterns and transit ridership did not support the larger expense of building a light rail system. This conclusion is consistent with the results of previously mentioned state and local studies. In order for a light rail system to be viable, the study team determined that the residential and employment land use densities along Georgia Avenue between Glenmont and Olney would need to be increased substantially. Such increases conflict with the area's master plans, which call for much of the area remaining suburban in nature with moderate densities.

## Feeder Bus Network

An essential part of the busway concept is a feeder bus network. **A system of six routes, each operating small buses at 15-minute intervals during peak periods and 60-minute intervals during the off-peak periods, offers the optimum combination of service and expense.** The small buses would circulate through neighborhoods to pick up and drop off passengers close to their homes and provide express service to and from the Glenmont Metrorail Station via the busway. Two examples of buses currently being produced that meet this application are the ElDorado Elf and the Orion II. Photos of each are shown in **Photos 3 and 4**.

Photo 3: ElDorado Efl Bus

These 21-passenger buses meet the capacity requirements of the frequent express service that is envisioned. They also have the appearance and operating characteristics that would be considered acceptable for vehicles circulating through neighborhood streets. They are relatively quiet, less conspicuous, and more appropriate in size than standard buses in neighborhood settings. Since the somewhat longer Ride-On buses that are currently used may be acceptable in some neighborhoods and other buses will certainly be available at a future time, these examples are only meant to provide guidance for subsequent planning.

Photo 4: Orion II Bus

The feeder bus network meets two important objectives. It offers residents very convenient express transit service by providing access via the busway to adjoining communities and to the Glenmont Metrorail station. At the same time, small buses that pick-up and drop-off people close to their homes allay a perceived hindrance to using transit by offering residents a way to avoid the inconvenience of driving their cars to a park-and-ride lot and transferring to a bus.

## Transit Passenger Estimating Procedures

This study tested two alternative networks of feeder bus routes for the purpose of gauging potential bus ridership on the busway as well as producing order-of-magnitude estimates of bus capital and operating costs for the new express buses. The alternative networks are shown in **Appendix C**. Since these networks were formulated for testing purposes only, this study does not recommend exact future locations for the routes in the networks. Additional bus operations studies and substantial community input will be needed to determine the final configuration of such routes.

Nevertheless, to gain an initial understanding of potential bus ridership on such a network of express buses, the study tested a variety of possible route locations and bus frequencies. The routes were designed to serve a combination of multi-family and single-family housing and commercial areas in the Olney and Aspen Hill areas. A large proportion of homes in Olney and Aspen Hill would be within 2-3 blocks of a bus route.

Each route was examined to determine the approximate number of households within 1/4 mile of the route. This distance is generally considered a reasonable walking distance to transit. The estimate of potential express bus usage is based in large part on the estimation of total households within 1/4 mile of the bus route. Using average trip rate factors developed by M-NCPPC staff, the bus passenger estimation process produced a ridership factor of 0.091 express bus passengers using the busway in the evening peak period per household. **Appendix D** provides the derivation of this ridership factor, the conversion of peak period transit trips to daily passenger miles of express travel per busway mile, and the various tests that were performed.

**Table 1** shows each feeder bus route in the two alternative networks that were tested , the number of households within 1/4 mile of the route, and the resulting express bus passenger trips on the busway in the evening peak period.

**Table 1: PM Peak Period Express Bus Passenger Trips on the Busway in Alternative Networks Tested**

| Route | Network Alternative 1 | | Network Alternative 2 | |
|---|---|---|---|---|
| | No. of Households | No. of Peak-Period Trips | No. of Households | No. of Peak Period Trips |
| 1 | 2,056 | 187 | 2,127 | 194 |
| 2 | 2,933 | 267 | 3,444 | 313 |
| 3 | 3,131 | 285 | 2,372 | 216 |
| 4 | 3,020 | 275 | 1,588 | 145 |
| 5 | 1,538 | 140 | n/a | n/a |
| 6 | 3,233 | 294 | 2,322 | 294 |
| 7 | 53,567 | 487 | 5,356 | 487 |
| **TOTAL*** | **16,182** | **1,472** | **15,472** | **1,408** |

* Note: Total is less than the sum of each route's figures since there is some overlap in the service areas of the various routes.

As a result of testing both feeder bus network alternatives, Network Alternative 2 was selected as the most advantageous. The routes in Network Alternative 2 are less circuitous, thus reducing travel time, and one less route is needed to produce nearly as many total transit trips as in Network Alternative 1, thus reducing capital and operating costs for the buses.

As shown in **Appendix D,** a test of Network Alternative 2 with the recommended 15-minute headways indicated that the express bus network alone would attract approximately 3,050 daily passenger miles of express travel per busway mile in 2010. This value exceeds by about 17% the minimum number (2,600) needed to warrant exclusive bus lanes on arterial roads such as Georgia Avenue. The minimum threshold of 2,600 daily passenger miles per busway mile is a nationally-accepted standard used by the transportation profession. It is derived from previous studies and most recently cited in the 1996 Delaware Regional Rail Study, prepared by Rummel Klepper & Kahl in conjunction Richard H. Pratt Consultant, Inc. and Parsons Brinckerhoff Quade & Douglas, Inc.

**Appendix D** also shows the results of testing other Network Alternative 2 scenarios, which include various transit access times and headways. For example, the tests varied the bus service headways during the peak three-hour periods in the morning and afternoon. When the interval between express buses was reduced to ten minutes, ridership increased to approximately 3,460 daily passenger miles per line mile, which exceeds the minimum ridership needed by 33%. When the interval was increased to 20 minutes, ridership decreased to 2,630, which barely meets the minimum ridership needed. Please note that all calculations were made at an early phase of this study when 8.7 miles was the assumed busway length. The proposed length of the busway is actually 7.0 miles, as was determined at a later phase of this study. If 7.0 miles had been used in the calculations in **Appendix D**, the daily passenger miles per busway mile would have been higher.

While a busway would make transit a significantly better travel choice in the study area than it is today and many commuters would be attracted to it, one cannot expect that the existence of this busway by itself will relieve the traffic congestion problems on Georgia Avenue. A busway is essential, but is only one of a series of related strategies that will need to be implemented to help provide relief for Georgia Avenue. An increase in transit-friendly development, significant reductions in the cost of using transit, and more convenient, comfortable, and dependable transit service will all be needed to make a positive impact on travel in the study area.

## Operating and Maintenance Cost Estimates

In addition to the capital cost estimates for each busway option, an estimate of operating and maintenance (O&M) costs was prepared. Most of the operational costs are based on the number of buses, the total hours that buses are in service, and how many miles they travel.

**Table 2** provides a summary of the O&M estimates with various headway assumptions for the two networks tested. The O&M estimate does not include costs of a new maintenance facility. The assumption is that the feeder buses will be serviced at existing facilities. Additional information on the cost estimates is provided in **Appendix E.**

**Table 2: O&M Cost Estimate Summary**

| Headway | Network Alternative 1 | Network Alternative 2 |
|---|---|---|
| 6 minutes | $9,481,000 | $1,169,000 |
| 10 minutes | $6,476,000 | $5,443,000 |
| 15 minutes | $4,483,000 | $3,778,000 |
| 20 minutes | $3,842,000 | $3,225,000 |

As shown in **Table 2,** the express feeder bus operating and maintenance costs for the recommended peak-period headways of 15 minutes and off-peak headways of 60 minutes for network Alternative 2 would be approximately $3.8 million per year. Changing the peak-period interval to 20 minutes would reduce the cost by about $0.5 million, whereas changing it to 10 minutes would increase the cost by about $1.7 million.

It should be noted that the contraflow busway option could have additional capital and O&M costs related to moving the physical barrier twice a day. Since this was the least favored option by both technical staff and citizens, further investigation of the potential costs was not undertaken.

### Bus Vehicle Capital Costs

The capital costs previously shown for each busway option do not include the costs associated with purchasing the small bus fleet. **Table 3** provides the additional bus vehicle capital costs for each headway and feeder bus network assumption. As shown in the table, the number of small buses needed is related to the frequency of service and the number and length of the routes. Each 21-passenger bus is assumed to cost $150,000.

**Table 3: Bus Vehicle Capital Costs**

| Network Alternative | Headway | Total Buses in Peak Period | Vehicle Costs |
|---|---|---|---|
| 1 | 6 minutes | 89 | $13,350,000 |
| | 10 minutes | 56 | 8,400,000 |
| | 15 minutes | 38 | 5,700,000 |
| | 20 minutes | 30 | 4,500,000 |
| 2 | 6 minutes | 78 | $11,700,000 |
| | 10 minutes | 48 | 7,200,000 |
| | 15 minutes | 33 | 4,950,000 |
| | 20 minutes | 26 | 3,900,000 |

**Table 3** shows that with the recommended peak-period headways of 15 minutes and off-peak headways of 60 minutes between buses on each of the six feeder bus routes, the cost of purchasing the small buses for Network Alternative 2 would be approximately $5 million. Changing the peak-period interval to 20 minutes would reduce the purchasing cost by about $1 million, whereas changing it to 10 minutes would increase the cost by about $2.2 million.

## Park-and-Ride Lots

Because park-and-ride lots near the busway provide access for people who either prefer to drive to the bus stop or are not well served by the feeder bus network, are important supporting elements to the busway, consideration was given to adding new park-and-ride facilities as well as upgrading existing facilities. Locations for new facilities in the Olney area and near Connecticut Avenue were examined. Possible upgrades were also examined for the existing park-and-ride lot on Norbeck Road and the lots recently constructed at the new Glenmont Metrorail station. Although the costs of these ancillary facilities would be relatively small, they depend highly on the results of engineering designs; therefore, calculations of their specific costs will be deferred to the State-sponsored project planning phase.

### Longwood Recreation Center Park-and-Ride Lot

One of the suggested feeder bus routes would begin in the vicinity of the Longwood Recreation Center at the northern edge of Olney. This location appears to be well-suited for a park-and-ride lot that would intercept southbound commuters who ordinarily pass through Olney. Transportation modeling indicates that a 140-space lot would satisfy expected park-and-ride demand at that location.

Based on meetings with staffs of the State Highway Administration, Montgomery County Recreation Department, Montgomery County Public Works and Transportation Department, and Montgomery County Department of Park and Planning, the most appropriate piece of property for the lot would be on a thin strip of publicly-owned land on the west side of Georgia Avenue, just north of Gold Mine Road. Part of the property is currently being used as a gravel surfaced overflow parking lot for youth sports activities. State and County representatives agree that a lot at this location is advantageous because of the opportunity to share its use for park-and-ride as well as youth sports purposes.

### Improved Norbeck Road Park-and-Ride Lot

The site of the existing Norbeck Road Park-and-Ride Lot should be designated as a major focal point for local bus service as well as the only intermediate stop for express bus service using the busway. This lot is a valuable resource, but is currently underutilized and in need of substantial improvement. The busway would be a catalyst for upgrading the lot and attracting many new commuters.



Some potential improvements include a new direct access road from Georgia Avenue to the lot, re-grading, new lighting, and re-landscaping to increase visibility and safety, adjustments to the area's local bus routes to focus more bus service at the lot, and possibly a small convenience retail establishment or other active use adjacent to the lot. Residents in the area as well as State and County representatives agree that such improvements are needed. There should be further analysis to determine whether implementation of such improvements can be justified in the near term, in advance of implementing the busway project.

**Glenmont Bus and Taxi Lot**

At the southern end of the busway, there would be a need for a bus passenger pick-up and drop-off area. Representatives from the Washington Metropolitan Area Transit Authority indicate that a good opportunity for such an area exists at the Glenmont Metrorail Station. One possibility is to re-designate WMATA's kiss-and-ride lot on the east side of Georgia Avenue for the busway's buses as well as for taxis, and at the same time adjust the size of the lot on the west side of Georgia Avenue and consolidate all kiss-and-ride spaces at that location. More detailed analyses during a State-sponsored project planning study may uncover other possibilities as well.

The southern end of the busway would be located at the Glenallan Avenue/Georgia Avenue intersection. Southbound buses from the busway would turn onto Glenallan Avenue to gain access to a potential Glenmont Bus and Taxi Lot. At the lot, passengers would have convenient access to the Metrorail Station and to other connecting bus routes.

**Other Park-and-Ride Lots Considered**

The intersection of Georgia Avenue and Connecticut Avenue was initially considered a possible location for an intermediate stop for the express buses using the busway and for a new park-and-ride location. This location, however, was later dropped from consideration. First, it was judged to be too close to both the existing Norbeck Road Park-and-Ride Lot and the Glenmont Metrorail station to be effective. For example, it is unlikely that the area's residents who want to reach the Glenmont Metrorail station would drive their cars to a lot at this Connecticut Avenue location, transfer to an express or local bus, ride the short distance to the Glenmont Metrorail Station, and then transfer to Metrorail. They would most likely either walk to feeder bus stops in their neighborhoods and board buses destined for the station, or drive their cars directly to the station, to avoid the additional time-consuming transfer. Second, avoiding an intermediate stop at Connecticut Avenue allows the express buses to travel on a shorter schedule. Third, the proximity and convenience of frequent feeder bus service circulating in the Aspen Hill neighborhoods diminish the need for an intermediate stop and a park-and-ride lot at the Connecticut Avenue intersection.

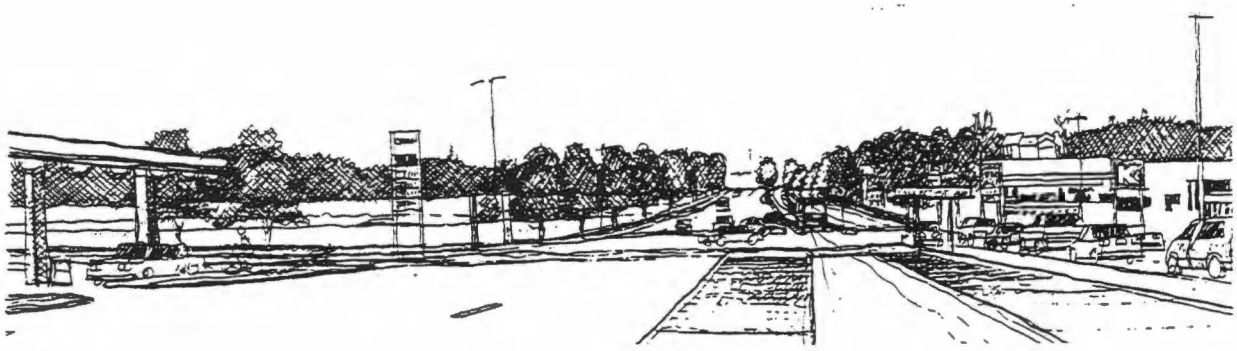
The study also considered a number of locations for a park-and-ride lot in the Olney town center area to support the busway. This review was based upon the park-and-ride lot/transit center study previously performed by the Montgomery County Department of Public Works and Transportation. However, as the feeder bus network concept and the proposal for a Longwood Recreation Center Park-and-Ride Lot evolved during the course of the study, it became apparent that a park-and-ride lot in Olney's town center would not be essential to the success of the busway. For this reason, and because of community concerns about placing such a lot in the town center, it was dropped from further consideration as part of this study. The future prospects of such a lot in the town center would have to depend on other operational considerations and community support.

## Urban Design Features

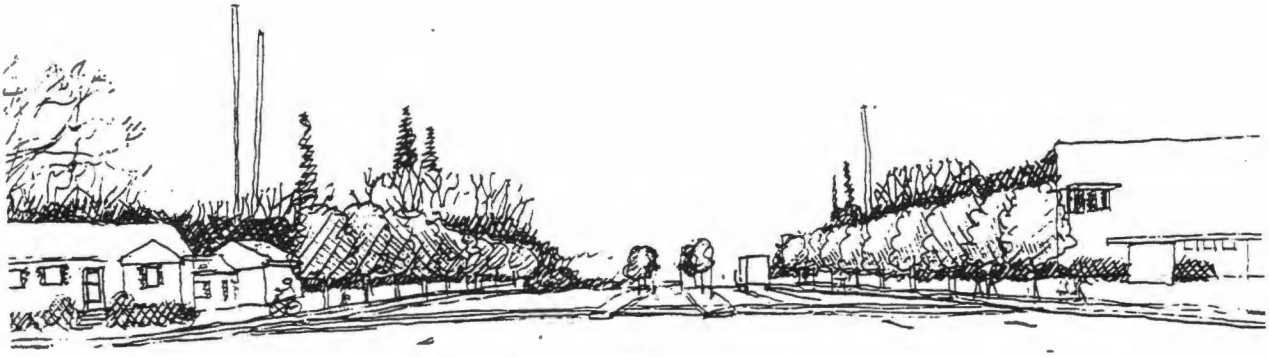
An essential part of the preferred busway concept is to create a more appealing and sustainable physical environment for residents and commercial properties along Georgia Avenue. The preferred cross sections in **Figure 2** include a major upgrade in landscaping for Georgia Avenue, consisting of an attractive tree-lined boulevard with linear pathways that enhance pedestrian and cyclist safety. Much of the 150-foot right-of-way, beyond the space needed for the existing pavement and the suggested busway lanes, would be used for new landscaping elements, such as the grass strips, trees, bus shelters, five-foot-wide sidewalks, and eight-foot-

**FIGURE 3: Landscaping Enhancements**

**at Hines Road in Olney**



**at Connecticut Avenue in Aspen Hill**



**at Weller Road in Glenmont**

wide hiker/biker trails. **Figure 3** shows how the improvement of Georgia Avenue could look at three intersections -- at Weller Road, at Connecticut Avenue, and at Hines Road.

A legitimate concern of some residents and business people on properties adjacent to Georgia Avenue is whether this additional landscaping will cause the Georgia Avenue pavement and right-of-way to encroach on their front yards or even require the purchase of their entire properties. It is fortunate that the impact of this project on adjacent properties is less than it would ordinarily be because much of the needed right-of-way on Georgia Avenue is either already owned by the state or is protected in the area master plans. Nevertheless, if the suggested 150-foot cross section were to be used along the entire length of the busway alignment, there would be some effect on properties, particularly near the southern and northern ends of the alignment where the least amount of right-of-way is available. A definitive answer on the optimum right-of-way boundaries, grading, and the resulting effects on properties would be obtained only after thorough engineering analyses and designs in a subsequent project planning study.

Even if a future project planning study recommends that the new right-of-way line should come several feet closer to some buildings in a few areas, the net effect of a tree-lined boulevard would be much better aesthetically and more beneficial than what exists today. Rather than a barren uninviting area in front of properties, which exists along many sections of Georgia Avenue, the new landscaping and associated elements would enhance the appearance and potentially the value of the adjoining properties.

The capital costs of the enhanced landscaping and associated elements are included in the project's construction costs, as specified earlier.

This study looked into the possible effects of the preferred right-of-way and landscaping on adjacent properties, but found that there are so many engineering considerations and potential variations in designs, that detailed engineering designs would be necessary to ascertain the optimum alignment and right-of-way boundaries and the resulting effects on each property. Such detailed designs are typically performed during project planning studies.

## Technical Review

The technical aspects of the work performed by the consultant team was reviewed by M-NCPPC staff as well as the study's Technical Advisory Committee. The Committee included staff of the Montgomery County Department of Park and Planning, Montgomery County Council, Montgomery County Department of Public Works and Transportation, Mid-county Services Center, State Highway Administration, Mass Transit Administration, Washington Metropolitan Area Transit Authority, and Metropolitan Washington Council of Governments. The Committee met monthly throughout the course of the study, providing valuable comments and recommendations to the study team.

## Citizen Participation

The study followed a public involvement process that included community meetings, focus group worksessions, a public workshop, and a public briefing. The following is an overview of the study's public involvement activities.

### Community Group Presentations

The process began with introductory presentations to two of the largest community groups in the study area in order to describe the general scope of the study as well as to solicit participants for two series of focus group worksessions. The two groups were the Mid-County Citizens Advisory Board and the Greater Olney Civic Association. Soon thereafter, a notice was sent out by the Planning Board about the commencement of the study, and every homeowners and business organization in the study area was contacted by M-NCPPC staff and invited to designate a representative to participate in the upcoming focus group worksessions. Also, leaflets were distributed on certain Ride-On and Metrobus runs traveling in the study area, informing passengers of the study and inviting them to participate in the focus groups.

**Focus Group Worksessions**

The consultant team led two series of focus group worksessions for the study. The first series of focus groups, which met in November 1996, provided input on the study's objectives and potential transit improvements in the Georgia Avenue study area. The second series of focus groups, which met in May 1997, provided feedback on the various busway options that the consultant team had prepared. Many of the participants were quite enthusiastic about the study and participated in both series of worksessions.

The focus groups succeeded in (a) informing the public about the study and the possible transit alternatives, (b) allowing public input into the evaluation of the alternatives, (c) informing the study team on local issues and concerns, (d) informing the study team on community goals and preferences, and (e) providing the study team guidance on the next phases of the study.

The first series of focus group worksessions were held on successive nights in November 1996 at the M-NCPPC offices in Silver Spring. The twenty-four participants received general information on busways and examples of various busway configurations. The objective of these worksessions was to receive input on participants' wants and needs with respect to the study as well as their views on needed transit improvements in the Georgia Avenue area. The participants were residents and business people from the Olney, Aspen Hill, and Glenmont areas.

The worksessions followed a structured agenda, which opened with brief introductions. The consultant team then provided a brief description of the study and invited the participants to make comments. To help the participants remain focused on aspects of the study as well as to probe possible issues, the team asked four basic questions:

Do you believe the busway will benefit you?

What do you believe are the benefits/disadvantages of the busway?

Discuss the advantages/disadvantages of the design options.

What features of the busway are most useful to you?

The participants' responses were recorded on flip charts. Many of the responses reflected individual perceptions as well as individual needs. Some of the views were consistent among most participants at all three worksessions while other views directly conflicted with each other. For example, all groups agreed that a feeder bus system connecting to a line haul busway was preferable. On the other hand, participants could not agree on whether to add a lane or take away a lane for the busway; whether carpools/vanpools should be allowed to share the reserved lane with buses; or, whether demand for bus transit would be high enough.

The most frequent comment was that people would like safer, faster, bus service that provides a convenient option to driving; they do not want a busway to be a "step-down" in terms of service quality when compared to driving. Some other common themes included:

- A busway appears to be a good transportation solution in the foreseeable future, but do not preclude further upgrades and other transit options such as light rail or Metrorail, as demand increases.

- Make sure the busway provides benefits for people up and down the study area.

- Enhance Georgia Avenue by beautifying it with improved landscaping, street furniture, and pedestrian/cycling amenities.

- Focus on ways to give transit passengers an advantage in terms of convenience, travel time, and safety.

A list of additional comments received from the first series of focus group worksessions is included in **Attachment F.**

The second series of focus group worksessions was held on successive nights in May 1997 at the M-NCPPC offices in Silver Spring. The fifteen participants received an update on the progress of the study and descriptions of the transit alternatives investigated. The objective of these worksessions



was to receive feedback on a preferred busway option and desired landscaping features.

Topics discussed included feasible busway alternatives, park and ride lots, feeder bus system, add-a-lane versus take-a-lane options, and landscape/streetscape elements. Comments from participants were recorded on flip charts. As with the first worksessions, the comments varied based on individual perceptions as well as preferences. The most frequent comment was that the best busway option is the one that would provide the most convenient and efficient service; at the same time, minimize impacts to the adjacent residences and businesses, and maximize the use of existing elements, such as the Norbeck Road Park-and-Ride Lot. Some other common themes included:

- The curb-side busway option is the easiest for the public to understand and use, but is the hardest to enforce.

- The median-side busway option is good for express bus service, but cannot accommodate local bus service.

- The contraflow busway option with movable concrete barriers makes more efficient use of the existing roadway, but has inherent problems with regard to logistics and cost of daily set-ups, safety, and appearance.

- The center busway has the most appeal, but leave room in the median to bypass stalled buses and accommodate local as well as express bus service, or establish a light rail line.

A list of additional comments received from the second series of focus group worksessions is included in **Attachment F.**

**Public Workshop**

In June 1997, the M-NCPPC staff held a public workshop at the Aspen Hill Library. The purpose of the workshop was to provide information and receive input from the community on the four busway options that were under consideration. Maps, designs, and other materials were displayed and staff responded to questions from the participants. Approximately 25 citizens participated in the workshop. The input received was very helpful and constructive. The majority viewpoint was that a center busway with substantial landscaping had the greatest appeal.

**Public Briefing**

In May 1998, after the formulation of the study's findings and recommendations, the M-NCPPC staff held a public briefing at the Aspen Hill Library. The purpose of the briefing was to describe in detail the preferred concept consisting of a center busway and accompanying landscaping enhancements, as conceived at the time, and to obtain feedback on the proposals. Approximately 30 citizens attended the briefing. The feedback was generally very positive regarding the proposals. The majority of participants were very pleased with the preferred concept.

Georgia Avenue

Busway Study

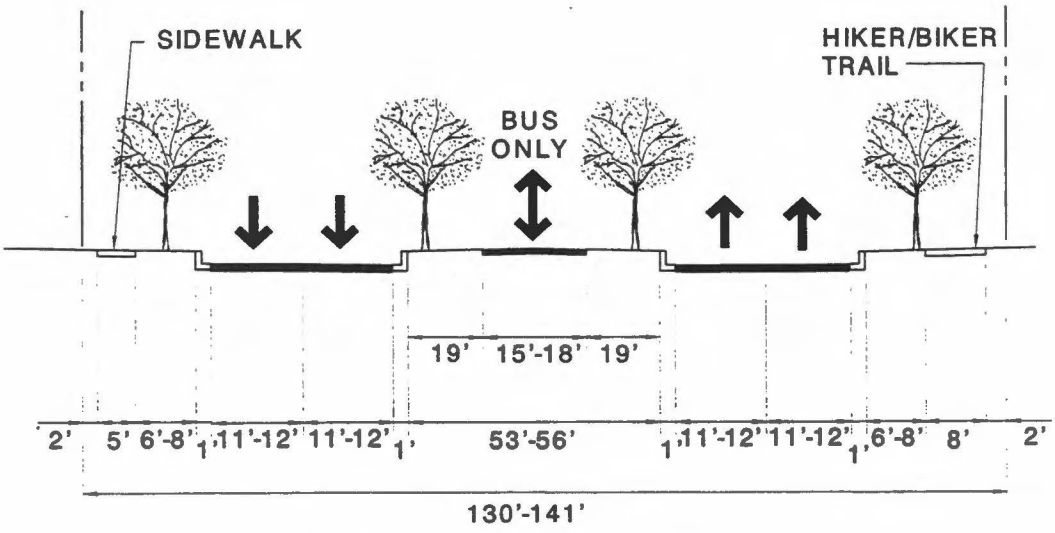
# Appendix A
# Typical Sections

*The Maryland-National Capital Park and Planning Commission*

# GEORGIA AVENUE BUSWAY STUDY
# PROPOSED TYPICAL SECTIONS

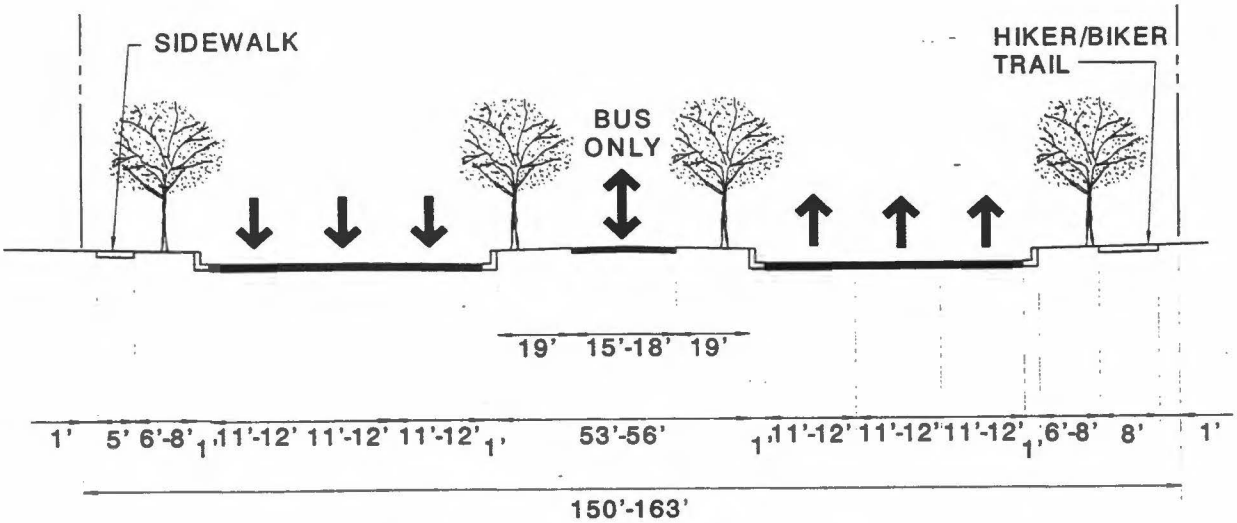
| OPTION | | TYPICAL SECTION ELEMENT | | | | | | | | | | | | | | | | | | | | | | | | TOTAL WIDTH ③ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SLOPE GRADING | BACKING | SIDEWALK | PLANTING PANEL ① | CURB/ GUTTER | BUS PULL-OUT | LANE | LANE | LANE | LANE | CURB/ GUTTER | PLANTING PANEL | BUSWAY, MEDIAN or LRT ② | PLANTING PANEL | CURB/ GUTTER | LANE | LANE | LANE | LANE | BUS PULL-OUT | CURB/ GUTTER | PLANTING PANEL ① | HIKER/ BIKER | BACKING | SLOPE GRADING | |
| **CURB-SIDE BUSWAY WITHOUT BUS PULLOUTS** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Full** | 4-lane; Take a Lane for Busway | - | 2 | 5 | 8 | 1 | - | 12 | - | - | 12 | 1 | - | 20 | - | 1 | 12 | - | - | 12 | - | 1 | 8 | 8 | 2 | - | **105** |
| **Reduced** | 4-lane; Take a Lane for Busway | - | 2 | 5 | 6 | 1 | - | 11 | - | - | 11 | 1 | - | 16 | - | 1 | 11 | - | - | 11 | - | 1 | 6 | 8 | 2 | - | **93** |
| **Full** | 6-lane; Add/Take a Lane for Busway | - | 2 | 5 | 8 | 1 | - | 12 | - | 12 | 12 | 1 | - | 20 | - | 1 | 12 | 12 | - | 12 | - | 1 | 8 | 8 | 2 | - | **129** |
| **Reduced** | 6-lane; Add/Take a Lane for Busway | - | 2 | 5 | 6 | 1 | - | 11 | - | 11 | 11 | 1 | - | 16 | - | 1 | 11 | 11 | - | 11 | - | 1 | 6 | 8 | 2 | - | **115** |
| **Full** | 8-lane; Add a Lane for Busway | - | 2 | 5 | 8 | 1 | - | 12 | 12 | 12 | 12 | 1 | - | 20 | - | 1 | 12 | 12 | 12 | 12 | - | 1 | 8 | 8 | 2 | - | **153** |
| **Reduced** | 8-lane; Add a Lane for Busway | - | 2 | 5 | 6 | 1 | - | 11 | 11 | 11 | 11 | 1 | - | 16 | - | 1 | 11 | 11 | 11 | 11 | - | 1 | 6 | 8 | 2 | - | **137** |
| **CURB-SIDE BUSWAY WITH BUS PULLOUTS** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Full** | 4-lane; Take a Lane for Busway | - | 2 | 5 | 8 | 1 | 11 | 12 | - | - | 12 | 1 | - | 20 | - | 1 | 12 | - | - | 12 | 11 | 1 | 8 | 8 | 2 | - | **127** |
| **Reduced** | 4-lane; Take a Lane for Busway | - | 2 | 5 | 6 | 1 | 11 | 11 | - | - | 11 | 1 | - | 16 | - | 1 | 11 | - | - | 11 | 11 | 1 | 6 | 8 | 2 | - | **115** |
| **Full** | 6-lane; Add/Take a Lane for Busway | - | 2 | 5 | 8 | 1 | 11 | 12 | - | 12 | 12 | 1 | - | 20 | - | 1 | 12 | 12 | - | 12 | 11 | 1 | 8 | 8 | 2 | - | **151** |
| **Reduced** | 6-lane; Add/Take a Lane for Busway | - | 2 | 5 | 6 | 1 | 11 | 11 | - | 11 | 11 | 1 | - | 16 | - | 1 | 11 | 11 | - | 11 | 11 | 1 | 6 | 8 | 2 | - | **137** |
| **Full** | 8-lane; Add a Lane for Busway | - | 2 | 5 | 8 | 1 | 11 | 12 | 12 | 12 | 12 | 1 | - | 20 | - | 1 | 12 | 12 | 12 | 12 | 11 | 1 | 8 | 8 | 2 | - | **175** |
| **Reduced** | 8-lane; Add a Lane for Busway | - | 2 | 5 | 6 | 1 | 11 | 11 | 11 | 11 | 11 | 1 | - | 16 | - | 1 | 11 | 11 | 11 | 11 | 11 | 1 | 6 | 8 | 2 | - | **159** |
| **MEDIAN-SIDE BUSWAY** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Full** | 4-lane; Take a Lane for Busway | - | 2 | 5 | 8 | 1 | - | 12 | - | - | 12 | 1 | - | 20 | - | 1 | 12 | - | - | 12 | - | 1 | 8 | 8 | 2 | - | **105** |
| **Reduced** | 4-lane; Take a Lane for Busway | - | 2 | 5 | 6 | 1 | - | 11 | - | - | 11 | 1 | - | 16 | - | 1 | 11 | - | - | 11 | - | 1 | 6 | 8 | 2 | - | **93** |
| **Full** | 6-lane; Add/Take a Lane for Busway | - | 2 | 5 | 8 | 1 | - | 12 | - | 12 | 12 | 1 | - | 20 | - | 1 | 12 | - | 12 | 12 | - | 1 | 8 | 8 | 2 | - | **129** |
| **Reduced** | 6-lane; Add/Take a Lane for Busway | - | 2 | 5 | 6 | 1 | - | 11 | - | 11 | 11 | 1 | - | 16 | - | 1 | 11 | - | 11 | 11 | - | 1 | 6 | 8 | 2 | - | **115** |
| **Full** | 8-lane; Add a Lane for Busway | - | 2 | 5 | 8 | 1 | - | 12 | 12 | 12 | 12 | 1 | - | 20 | - | 1 | 12 | 12 | 12 | 12 | - | 1 | 8 | 8 | 2 | - | **153** |
| **Reduced** | 8-lane; Add a Lane for Busway | - | 2 | 5 | 6 | 1 | - | 11 | 11 | 11 | 11 | 1 | - | 16 | - | 1 | 11 | 11 | 11 | 11 | - | 1 | 6 | 8 | 2 | - | **137** |
| **SINGLE-LANE CENTER LANE BUSWAY WITHOUT BUS PULLOUTS** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Full** | 4-lane; Center Lane Busway | - | 2 | 5 | 8 | 1 | - | 12 | - | - | 12 | 1 | 19 | 18 | 19 | 1 | 12 | - | - | 12 | - | 1 | 8 | 8 | 2 | - | **141** |
| **Reduced** | 4-lane; Center Lane Busway | - | 2 | 5 | 6 | 1 | - | 11 | - | - | 11 | 1 | 19 | 15 | 19 | 1 | 11 | - | - | 11 | - | 1 | 6 | 8 | 2 | - | **130** |
| **Full** | 6-lane; Center Lane Busway | - | 1 | 5 | 8 | 1 | - | 12 | 12 | - | 12 | 1 | 19 | 18 | 19 | 1 | 12 | 12 | - | 12 | - | 1 | 8 | 8 | 1 | - | **163** |
| **Reduced** | 6-lane; Center Lane Busway | - | 1 | 5 | 6 | 1 | - | 11 | 11 | - | 11 | 1 | 19 | 15 | 19 | 1 | 11 | 11 | - | 11 | - | 1 | 6 | 8 | 1 | - | **150** |
| **TWO-LANE CENTER LANE BUSWAY WITHOUT BUS PULLOUTS** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Full** | 4-lane; 2-Lane Center Lane Busway | - | 2 | 5 | 8 | 1 | - | 12 | - | - | 12 | 1 | 15 | 26 | 15 | 1 | 12 | - | - | 12 | - | 1 | 8 | 8 | 2 | - | **141** |
| **Reduced** | 4-lane; 2-Lane Center Lane Busway | - | 2 | 5 | 6 | 1 | - | 11 | - | - | 11 | 1 | 15 | 23 | 15 | 1 | 11 | - | - | 11 | - | 1 | 6 | 8 | 2 | - | **130** |
| **Full** | 6-lane; 2-Lane Center Lane Busway | - | 1 | 5 | 8 | 1 | - | 12 | 12 | - | 12 | 1 | 15 | 26 | 15 | 1 | 12 | 12 | - | 12 | - | 1 | 8 | 8 | 1 | - | **163** |
| **Reduced** | 6-lane; 2-Lane Center Lane Busway | - | 1 | 5 | 6 | 1 | - | 11 | 11 | - | 11 | 1 | 15 | 23 | 15 | 1 | 11 | 11 | - | 11 | - | 1 | 6 | 8 | 1 | - | **150** |
| **CONTRA-FLOW BUSWAY** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Full** | 4-lane; Contraflow Busway | - | 2 | 5 | 8 | 1 | - | 12 | - | - | 14 | 1 | - | 20 | - | 1 | 14 | - | - | 12 | - | 1 | 8 | 8 | 2 | - | **109** |
| **Reduced** | 4-lane; Contraflow Busway | - | 2 | 5 | 6 | 1 | - | 11 | - | - | 13 | 1 | - | 16 | - | 1 | 13 | - | - | 11 | - | 1 | 6 | 8 | 2 | - | **97** |
| **Full** | 6-lane; Contraflow Busway | - | 2 | 5 | 8 | 1 | - | 12 | - | 12 | 14 | 1 | - | 20 | - | 1 | 14 | 12 | - | 12 | - | 1 | 8 | 8 | 2 | - | **133** |
| **Reduced** | 6-lane; Contraflow Busway | - | 2 | 5 | 6 | 1 | - | 11 | - | 11 | 13 | 1 | - | 16 | - | 1 | 13 | 11 | - | 11 | - | 1 | 6 | 8 | 2 | - | **119** |
| **LIGHT RAIL TRANSIT** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Full** | 4-lane; Light Rail Transit | - | 2 | 5 | 8 | 1 | - | 12 | - | - | 12 | 1 | 8 | 36 | 8 | 1 | 12 | - | - | 12 | - | 1 | 8 | 8 | 2 | - | **137** |
| **Reduced** | 4-lane; Light Rail Transit | - | 2 | 5 | 6 | 1 | - | 11 | - | - | 11 | 1 | 6 | 30 | 6 | 1 | 11 | - | - | 11 | - | 1 | 6 | 8 | 2 | - | **119** |
| **Full** | 6-lane; Light Rail Transit | - | 2 | 5 | 8 | 1 | - | 12 | - | 12 | 12 | 1 | 8 | 36 | 8 | 1 | 12 | 12 | - | 12 | - | 1 | 8 | 8 | 2 | - | **161** |
| **Reduced** | 6-lane; Light Rail Transit | - | 2 | 5 | 6 | 1 | - | 11 | - | 11 | 11 | 1 | 6 | 30 | 6 | 1 | 11 | 11 | - | 11 | - | 1 | 6 | 8 | 2 | - | **141** |

**NOTES:**
① Grass Panel includes width for bus stop and shelter setback
② Width does not allow for light rail stations
③ Total width does not include outside grading




## CENTER BUSWAY

(NORTH OF NORBECK ROAD)

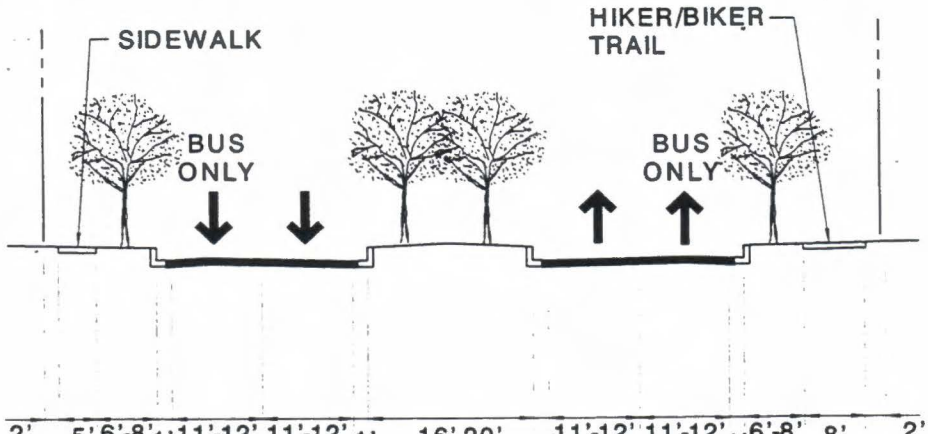



## CENTER BUSWAY

(SOUTH OF NORBECK ROAD)

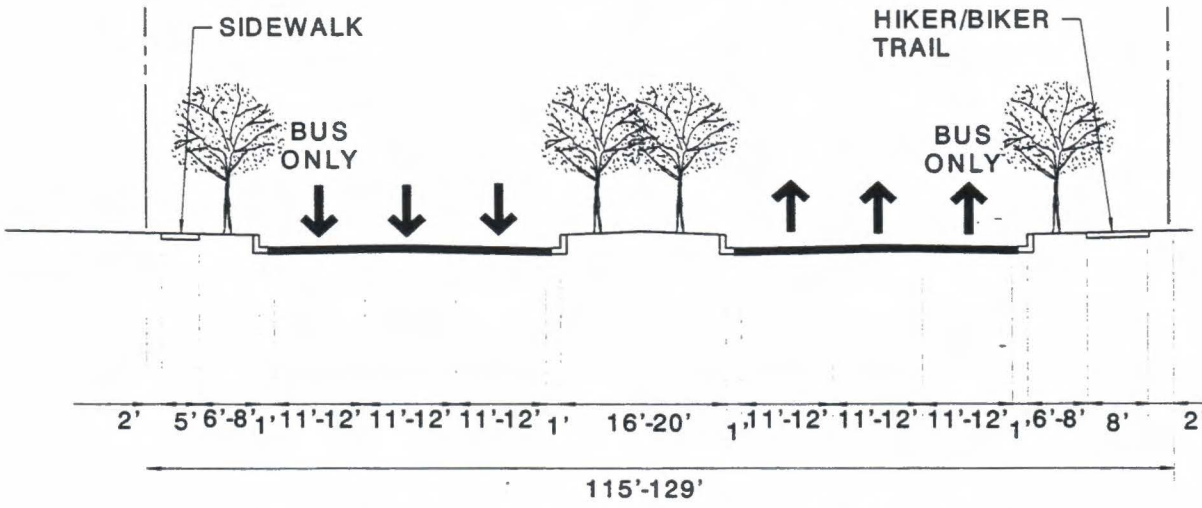
TYPICAL SECTIONS
GEORGIA AVE. (MD 97)

A-2



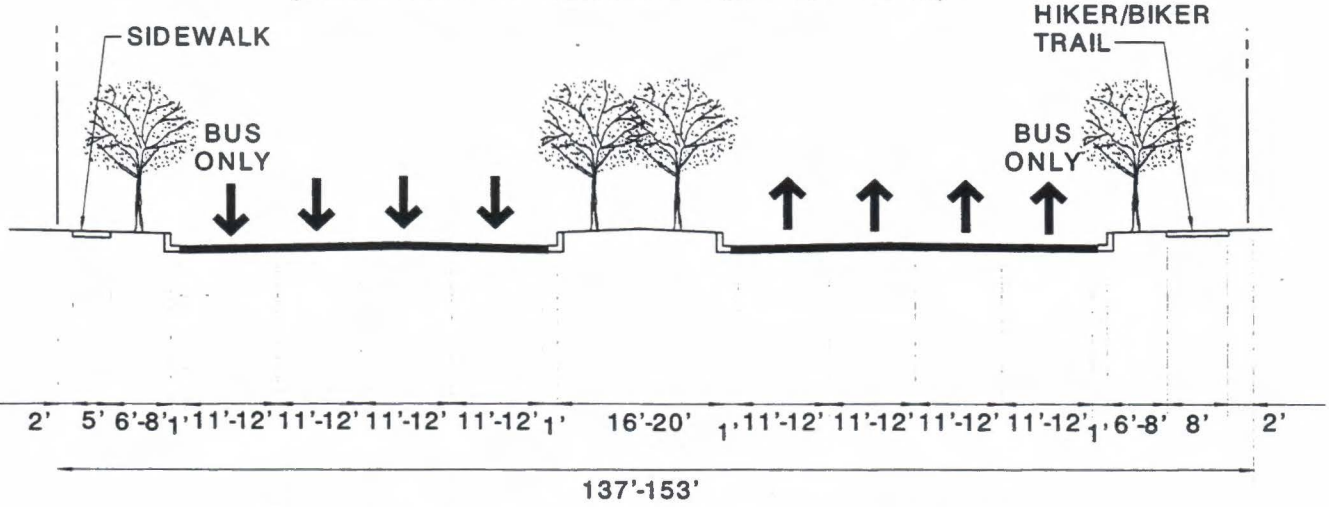

## 4 LANE CURB-SIDE BUSWAY

(TAKE AWAY A GENERAL PURPOSE LANE)




## 6 LANE CURB-SIDE BUSWAY

(TAKE AWAY A GENERAL PURPOSE LANE)

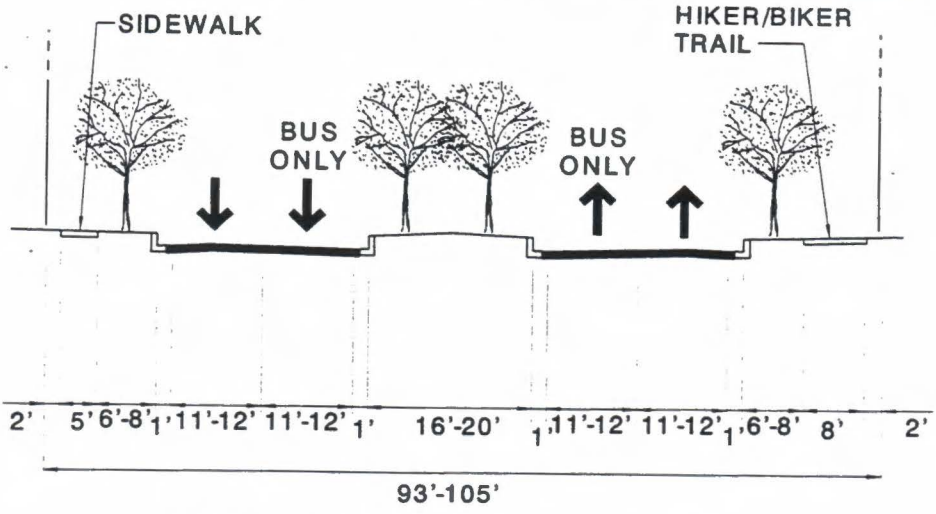



## 8 LANE CURB-SIDE BUSWAY

(ADD BUSWAY LANE)

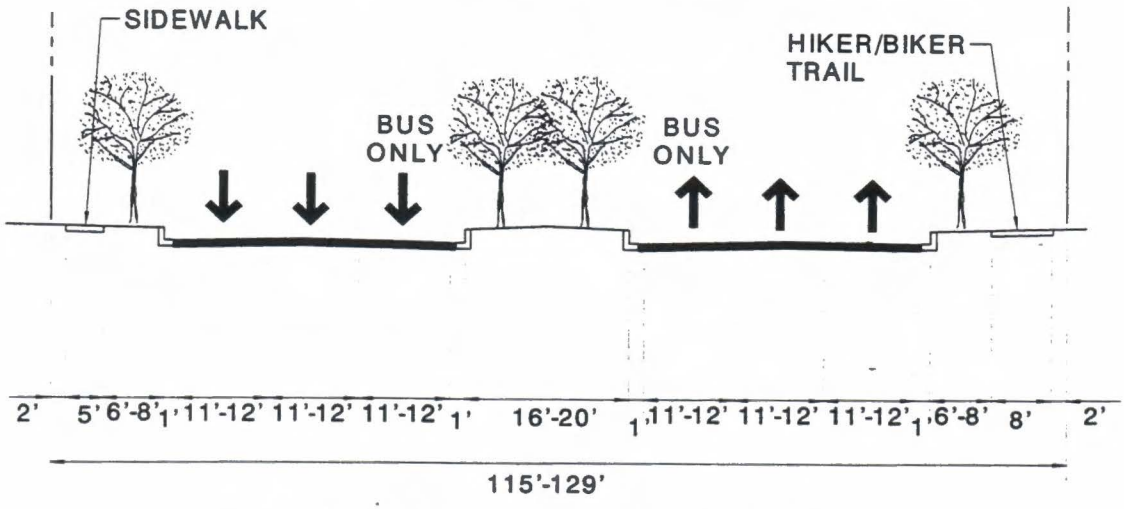
NOTE:
ADD 11' EACH SIDE TO PROVIDE FOR A BUS PULLOUT.

TYPICAL SECTIONS
GEORGIA AVE. (MD 97)



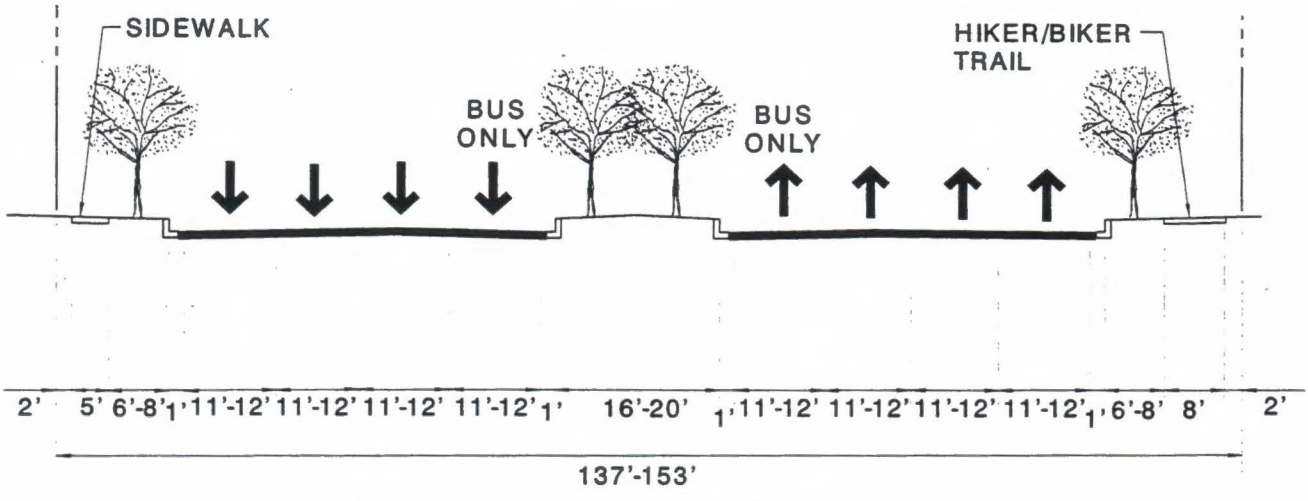

## MEDIAN-SIDE BUSWAY

(TAKE AWAY A GENERAL PURPOSE LANE)




## MEDIAN-SIDE BUSWAY

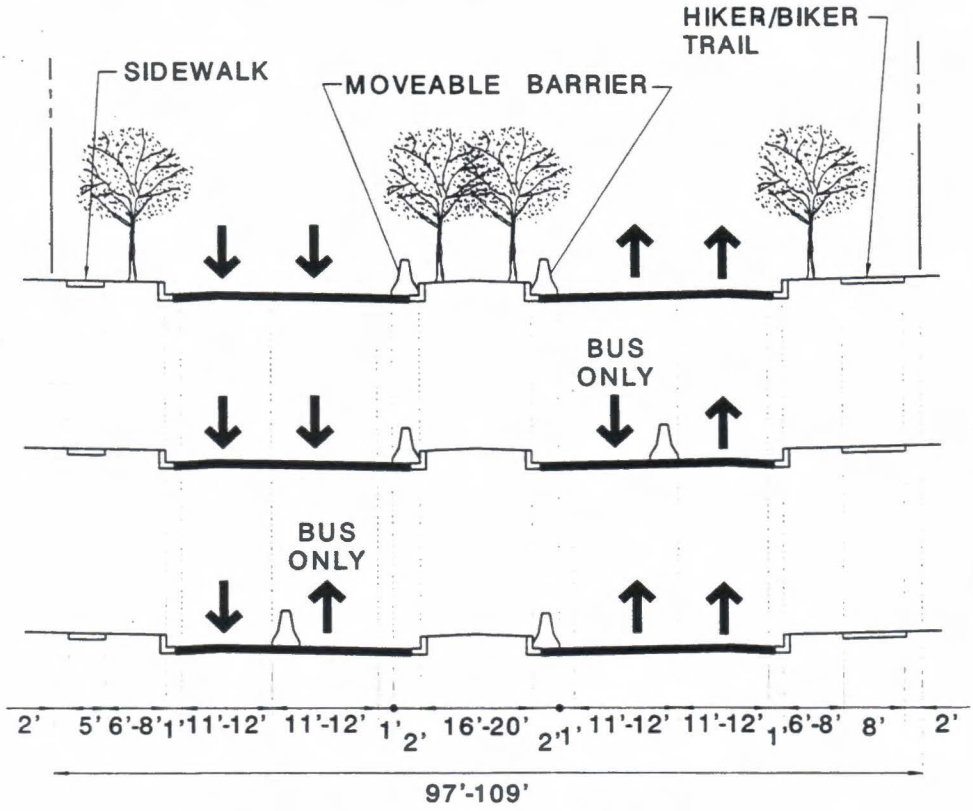
(TAKE AWAY A GENERAL PURPOSE LANE)




## MEDIAN-SIDE BUSWAY

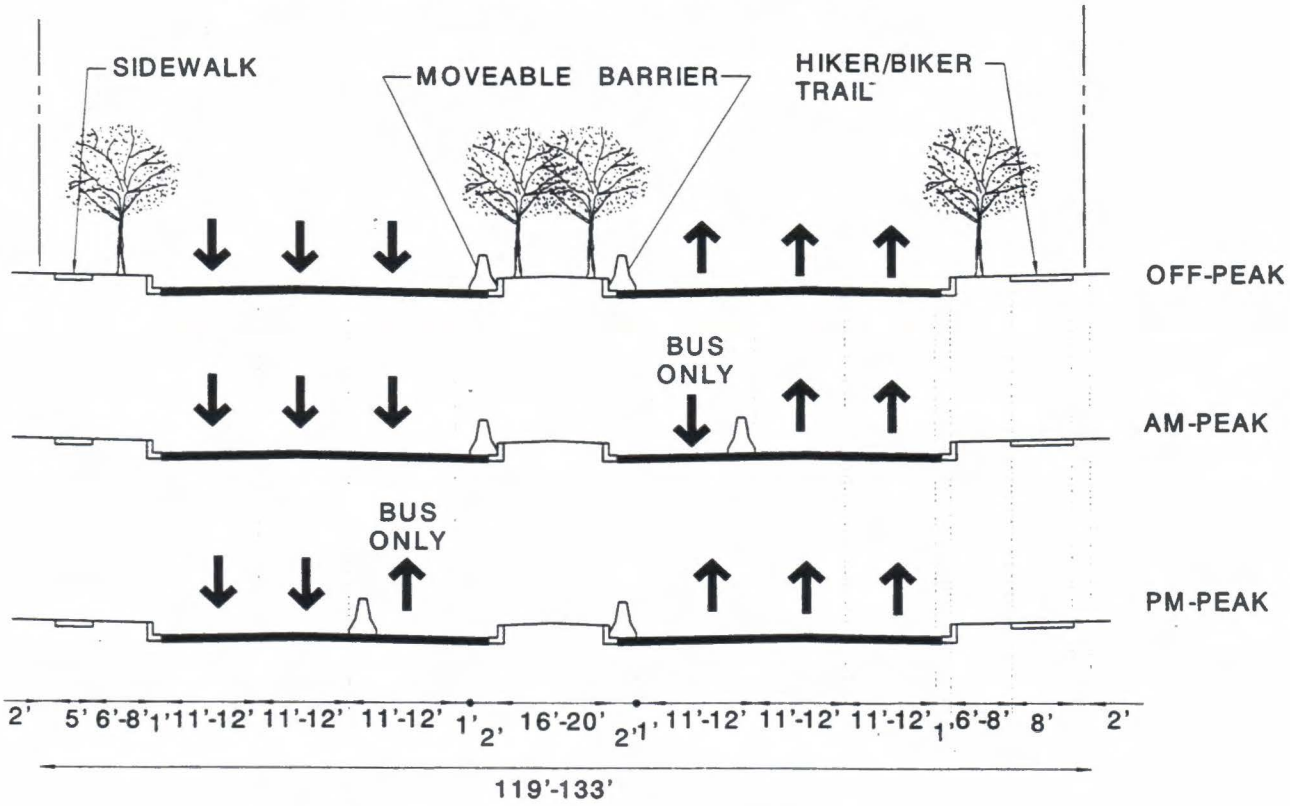
(ADD BUSWAY LANE)

TYPICAL SECTIONS
GEORGIA AVE. (MD 97)




## CONTRAFLOW BUSWAY

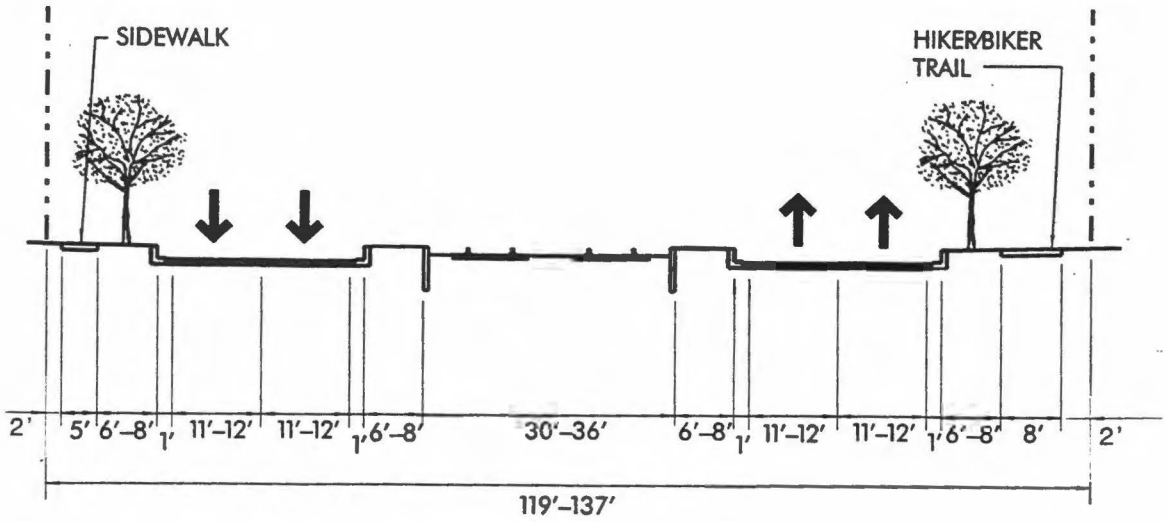
(TAKE AWAY A GENERAL PURPOSE LANE)



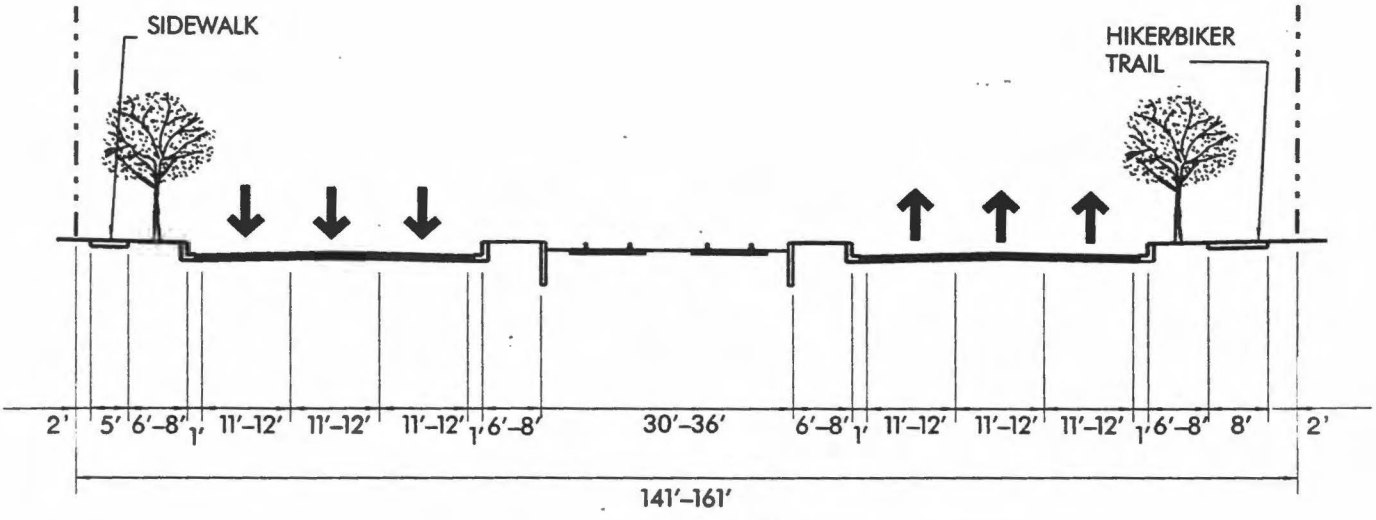

## CONTRAFLOW BUSWAY

(TAKE AWAY A GENERAL PURPOSE LANE)

TYPICAL SECTIONS
GEORGIA AVE. (MD 97)




CENTER LIGHT RAIL




CENTER LIGHT RAIL

TYPICAL SECTIONS
GEORGIA AVE. (MD 97)

A-6


# Appendix B
# Recommendation Matrix

# Georgia Avenue Busway
# Recommendation Matrix

| Issue | Center Busway (Express Only) | Center Busway (Express/Local) | Median-Side Busway (Express Only) | Curb-Side Busway (Express/Local) | Contra-Flow (Express Only) |
|---|---|---|---|---|---|
| **Description** | • assumes bus would leave busway to serve park-and-ride lot at Norbeck<br>• assumes no stops within busway<br>• local buses would operate in general purpose lanes<br>• could provide neighborhood circulator with direct connection to Metro | • assumes bus would leave busway to serve park-and-ride lot at Norbeck<br>• assumes bus would serve all major bus stops from within busway<br>• local buses could operate in busway<br>• could provide neighborhood circulator with direct connection to Metro | • assumes bus would leave busway to serve park-and-ride lot at Norbeck<br>• assumes no stops within busway<br>• could provide neighborhood circulator with direct connection to Metro<br>• there are two options for providing the bus lane - add a lane or take an existing general purpose lane | • assumes bus would leave busway to serve park-and-ride lot at Norbeck<br>• assumes that both express and local service could be accommodated in busway<br>• could provide neighborhood circulator with direct connection to Metro<br>• there are two options for providing the bus lane - add a lane or take an existing general purpose lane | • assumes bus would leave busway to serve park-and-ride lot at Norbeck<br>• assumes no stops within busway<br>• assumes operation in peak direction in median-side lane of off-peak travel lanes<br>• assumes temporary barrier separation of median side lanes<br>• could provide neighborhood circulator with direct connection to Metro |
| **Passenger Access** | ± passengers could board only at bus stops within major park-and-ride lots<br>± passengers could board a neighborhood circulator<br>– does not provide service advantages to southern segments | + passengers only cross ½ road instead of full road crossing<br>+ serves local and express; serves southern segments<br>± passengers could board a neighborhood circulator<br>± signalized mid-signal crosswalks needed for passengers to cross road from median<br>± median bus stop must be protected from nearby traffic | ± passengers could board only at bus stops within major park-and-ride lots<br>± passengers could board a neighborhood circulator<br>– local buses still use general purpose lanes<br>– bus must deviate from median busway to park-and-ride lots for boardings/alightings<br>+ allows two way express operations | ± passengers could board only at bus stops within major park-and-ride lots<br>± passengers could board a neighborhood circulator<br>+ curbside passenger boarding and alighting most like standard bus operations<br>+ provides both local and express buses with time savings (using bus pull-offs)<br>+ allows two way express operations | ± passengers could board only at bus stops within major park-and-ride lots<br>± passengers could board a neighborhood circulator |
| **Rating**<br>1 - Poor<br>5 - Fair<br>10 - Good | 5 | 6 | Add-a-Lane: 4<br>Take-a-Lane: 5<br>Combination: 5 | Add-a-Lane: 6<br>Take-a-Lane: 7<br>Combination: 7 | 5 |



+ positive attribute
– negative attribute
± neutral attribute

## Georgia Avenue Busway
## Recommendation Matrix

| Issue | Center Busway (Express Only) | Center Busway (Express/Local) | Median-Side Busway (Express Only) | Curb-Side Busway (Express/Local) | Contra-Flow (Express Only) |
|---|---|---|---|---|---|
| **Bus Operations** | + barrier separation between intersections maximizes speed, minimizes conflicts with general purpose traffic<br>± time advantage only for the peak direction, if off-peak lanes are congested<br>– does not enhance local service | + barrier separation between intersections maximizes speed, minimizes conflicts with general purpose traffic<br>+ provides travel time advantage for both express and local buses<br>– barrier separation limits number of points where buses could enter and exit busway<br>– median alignment could complicate placement of mid-signal stops | + buses could enter or exit busway at any point<br>+ buses could pass in general purpose lanes<br>– lack of physical barrier separation reduces speed and increases potential for general traffic conflicts<br>– provides only express service with time savings | + most like standard bus operation; i.e. bus doors would be on curb side<br>+ buses could enter or exit busway at any point<br>+ accommodates mid-signal stops--buses could stop at most any point along right-of way<br>+ buses could pass at bus pull-offs or in general purpose lanes<br>– lack of barrier separation reduces speed and increases potential for general traffic conflicts<br>– increases the number of potential general purpose right turn conflicts<br>– lane enforcement is more difficult | + increases bus operation speeds<br>– complicated bus turning movements at busway entrance and exit<br>– only peak direction for bus has time savings advantages<br>– local buses still use general purpose traffic lane |
| **Rating**<br>1 - Poor<br>5 - Fair<br>10 - Good | 7 | 8 | Add-a-Lane: 4<br>Take-a-Lane: 4<br>Combination: 4 | Add-a-Lane: 3<br>Take-a-Lane: 3<br>Combination: 3 | 5 |
| **Traffic Operations** | + would not eliminate general purpose lane(s)<br>+ separates buses from general traffic, minimizing potential auto-bus conflicts<br>– would interfere with general purpose left turn movements<br>– requires unique marking and signage to prevent autos blocking and/or turning into busway | + would not eliminate general purpose lane<br>+ removes local buses from general traffic, minimizing potential auto-bus conflicts<br>– would interfere with general purpose left turn movements<br>– signalized crosswalks required for mid-signal bus stops<br>– requires unique marking and signage to prevent autos blocking and/or turning into busway | – would eliminate general purpose lane in both directions (take a lane option)<br>+ would add a lane for exclusive bus use (add a lane option)<br>– lack of barrier separation would not prevent auto-bus conflicts and would require enforcement of bus lane restriction<br>– would conflict with left turning movements at intersections | – would eliminate general purpose lane in both directions (take-a-lane scenario)<br>+ would add a lane for exclusive bus use (add a lane option)<br>– lack of barrier separation would not prevent auto-bus conflicts and would require enforcement of bus lane restriction<br>– would conflict with right turning movements at intersections<br>– would conflict with residential and commercial driveway traffic | + would not eliminate general purpose lane in peak direction<br>– eliminates lane in off-peak direction<br>+ separates buses from general traffic, preventing potential auto-bus conflicts<br>– requires unique marking and signage to prevent autos blocking and turning left into busway<br>– would conflict with turning movements at intersections and driveways<br>– requires barrier placement and removal twice daily |
| **Rating**<br>1 - Poor<br>5 - Fair<br>10 - Good | 7 | 7 | Add-a-Lane: 7<br>Take-a-Lane: 1<br>Combination: 2 | Add-a-Lane: 8<br>Take-a-Lane: 2<br>Combination: 3 | 3 |



+ positive attribute
– negative attribute
± neutral attribute

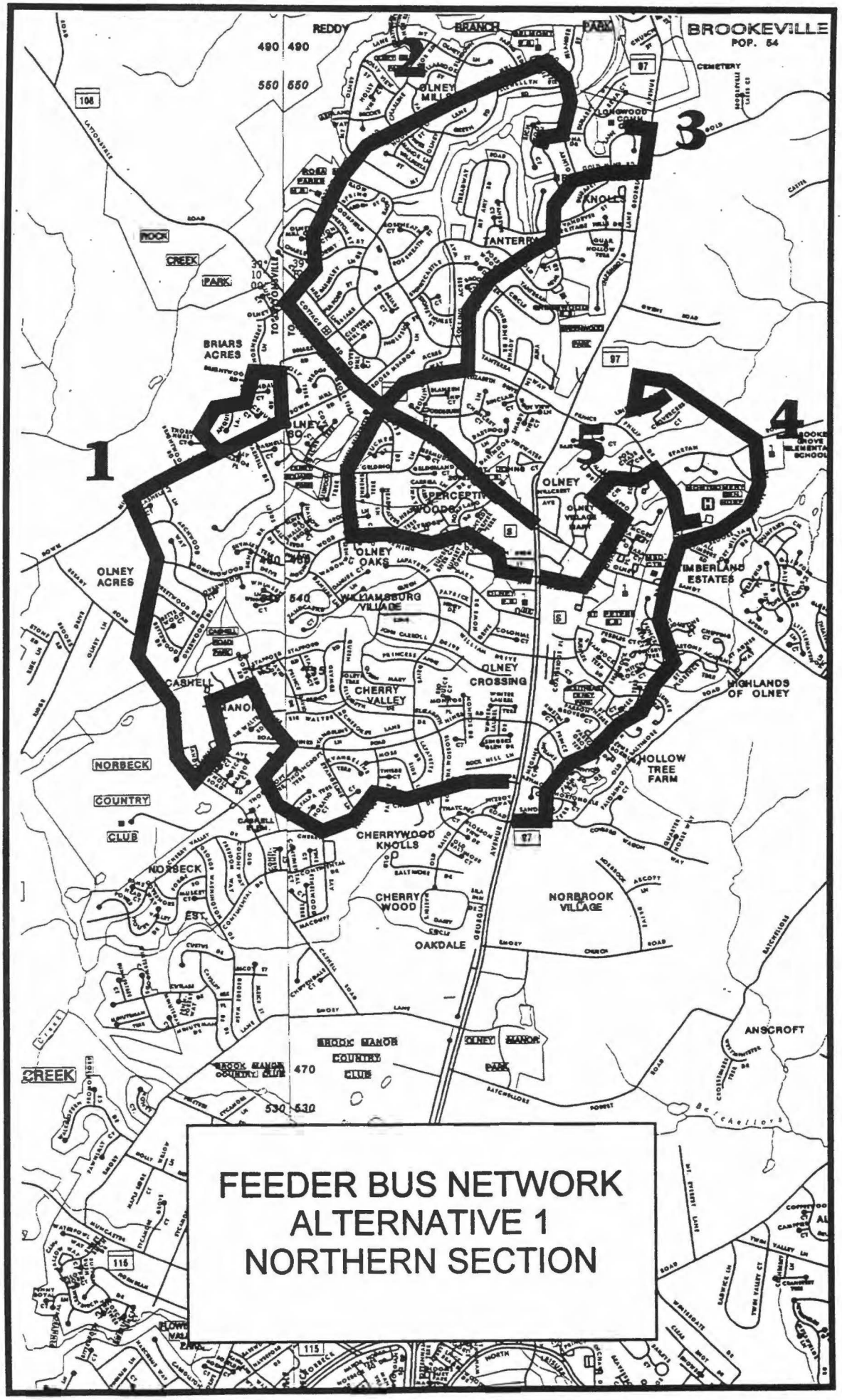
**Georgia Avenue Busway**
**Recommendation Matrix**

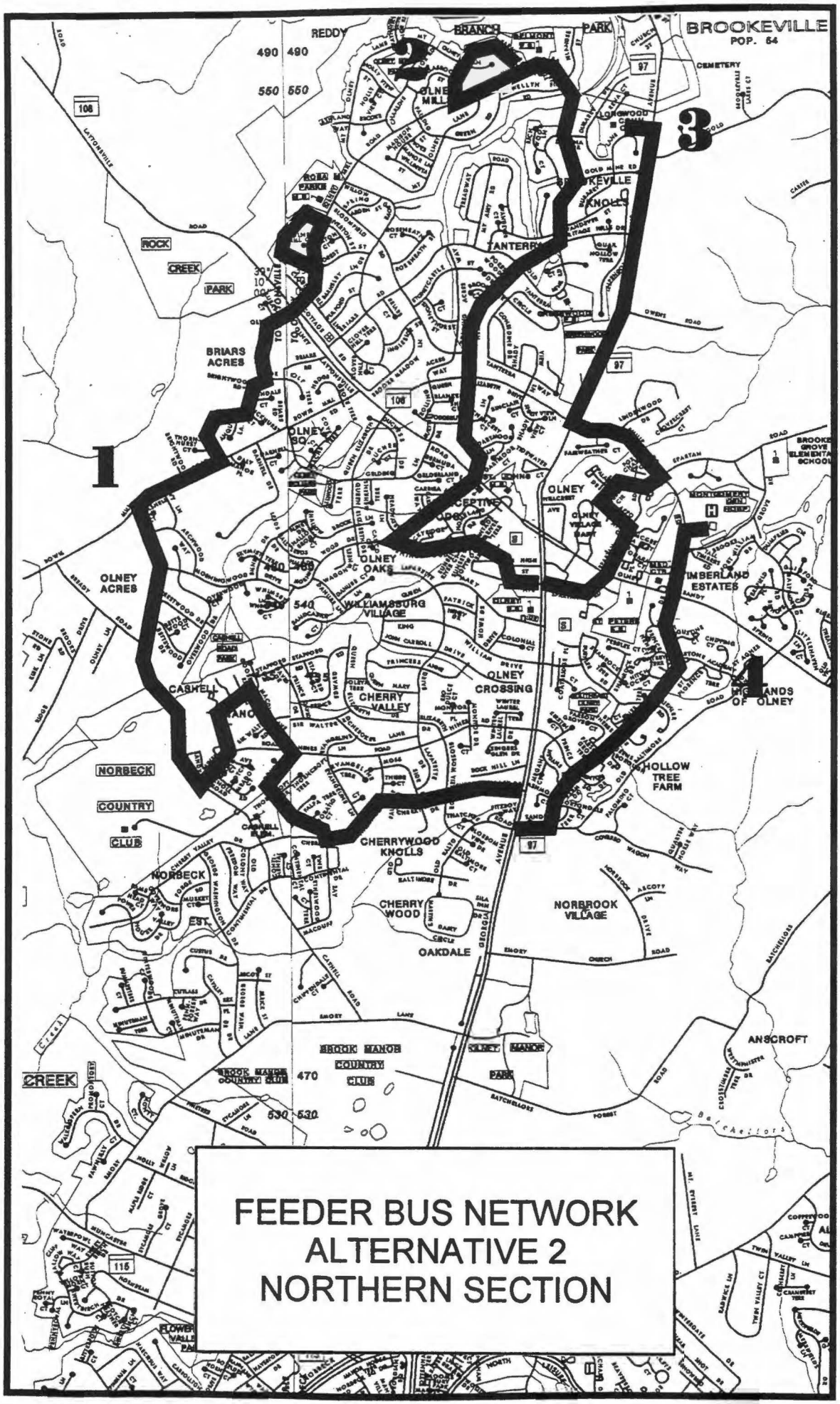
| ISSUE | CENTER BUSWAY (EXPRESS ONLY) | CENTER BUSWAY (EXPRESS AND LOCAL) | MEDIAN-SIDE BUSWAY (EXPRESS ONLY) | CURB-SIDE BUSWAY (EXPRESS/LOCAL) | CONTRA-FLOW (EXPRESS ONLY) |
|---|---|---|---|---|---|
| **LOCAL IMPACTS** | –additional right-of-way likely to be required near Glenmont and Olney<br>–replaces wide median with two smaller planting areas (medians) | –additional right-of-way likely to be required near Glenmont and Olney<br>–replaces wide median with two smaller planting areas (medians) | +no impact on driveways or curbside planting strips (take a lane option)<br>+additional right-of-way unlikely to be required (take a lane option)<br>+could be done within existing typical section (take a lane option)<br>–additional right-of-way likely to be required (add a lane option)<br>–could require adding a lane for busway (add a lane option)<br>±no major impact on landscaping (take a lane option)<br>+retains existing median (both options) | +additional right-of-way unlikely to be required (take a lane option)<br>+could be done within existing typical section (take a lane option)<br>–additional right-of-way likely to be required (add a lane option)<br>–could require adding a lane for busway (add a lane option)<br>–additional right-of-way likely to be required for bus pull-outs<br>±no major impact on landscaping (take a lane option)<br>+retains existing median (both options) | +minor impact on road cross section<br>–major impact on streetscape appearance due to need for extensive signage and striping, and possibly movable barriers<br>+no physical impact on driveways or curbside planting strips<br>+additional right-of-way not likely<br>+retains existing median |
| **RATING**<br>1 - Poor<br>5 - Fair<br>10 - Good | **Right-of-Way - 6**<br>**Community - 5** | **Right-of-Way - 5**<br>**Community - 5** | Add-a-Lane: **R - 3, C - 6**<br>Take-a-Lane: **R - 8, C - 6**<br>Combination: **R - 6, C - 6** | Add-a-Lane: **R - 2, C - 6**<br>Take-a-Lane: **R - 7, C - 6**<br>Combination: **R - 5, C - 6** | **Right-of-Way - 8**<br>**Community - 4** |
| **ESTIMATED CAPITAL COST** | **One-lane (ultimate two-lane)**<br>**$47 - $52 million** | **Two-Lane**<br>**$52 - $58 million** | **Add a Lane**<br>**$47 - $52 million**<br>**Take a Lane**<br>**$14 - $16 million**<br>**Combination**<br>**$29 - $33 million** | **Add a Lane**<br>**$47 - $52 million**<br>**Take a Lane**<br>**$14 - $16 million**<br>**Combination**<br>**$29 - $33 million** | **$20 - $22 million** |

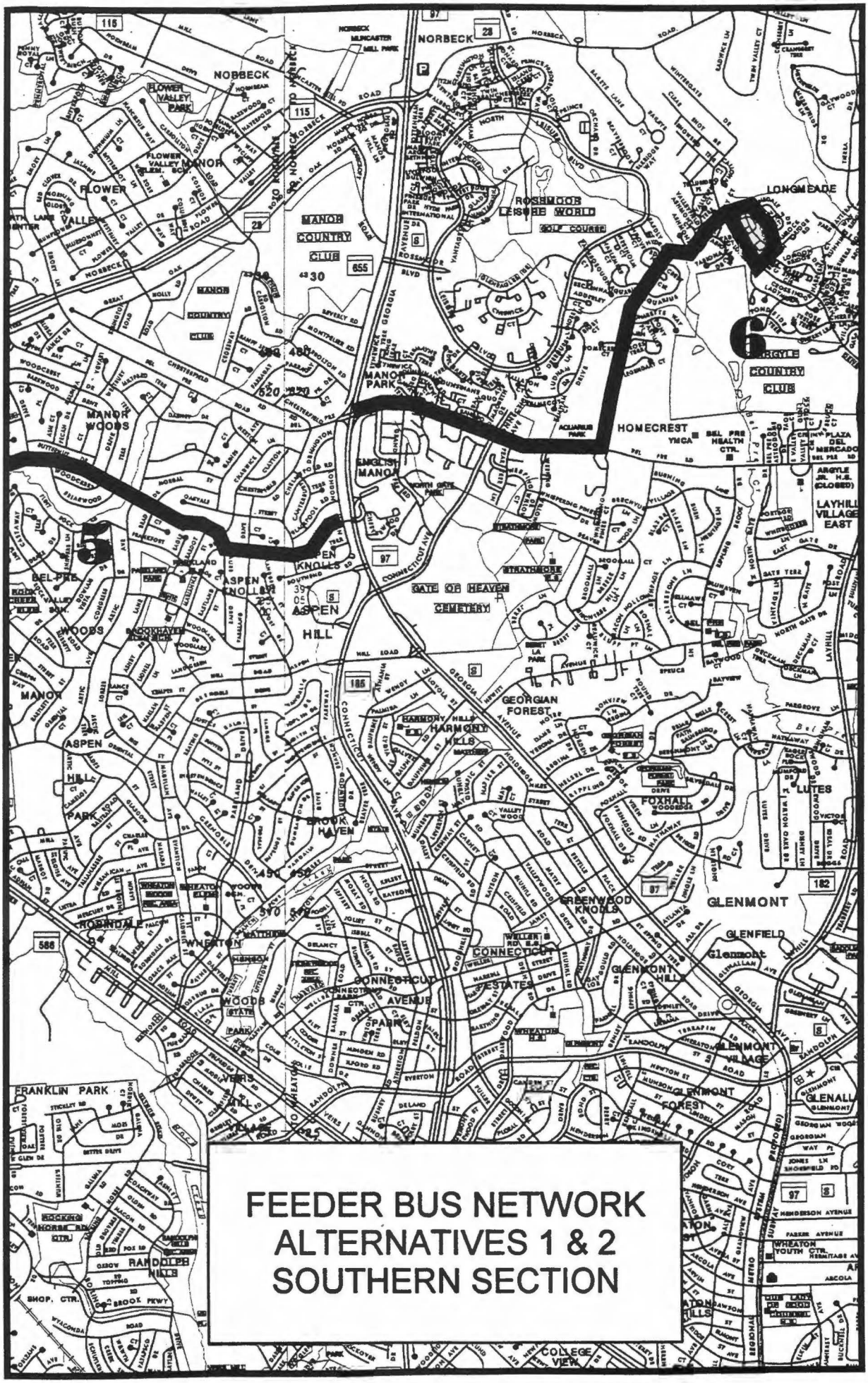


+ positive attribute
– negative attribute
± neutral attribute


# Appendix C
# Express Bus
# Network Alternatives


BROOKEVILLE
POP. 54
REDDY BRANCH PARK
OLNEY MILL
LONGWOOD CONN
CEMETERY
KNOLLS
TANTERRA
ROCK CREEK PARK
BRIARS ACRES
OLNEY
OLNEY VILLAGE PARK
PERCEPTIVE WOODS
OLNEY OAKS
OLNEY ACRES
WILLIAMSBURG VILLAGE
TIMBERLAND ESTATES
OLNEY CROSSING
CHERRY VALLEY
CASHELL MANOR
HIGHLANDS OF OLNEY
HOLLOW TREE FARM
NORBECK COUNTRY CLUB
CHERRYWOOD KNOLLS
NORBECK ESTATES
CHERRY WOOD
OAKDALE
NORBROOK VILLAGE
ANSCROFT
BROOK MANOR COUNTRY CLUB
OLNEY MANOR PARK
ROCK CREEK
1
2
3
4
5
6
7
FEEDER BUS NETWORK
ALTERNATIVE 1
NORTHERN SECTION


BROOKEVILLE
POP. 54
1
3
OLNEY
OLNEY ACRES
BRIARS ACRES
OLNEY OAKS
WILLIAMSBURG VILLAGE
OLNEY CROSSING
CHERRY VALLEY
CHERRYWOOD KNOLLS
CHERRY WOOD
OAKDALE
NORBROOK VILLAGE
HOLLOW TREE FARM
HIGHLANDS OF OLNEY
TIMBERLAND ESTATES
ANSCROFT
NORBECK COUNTRY CLUB
BROOK MANOR COUNTRY CLUB
ROCK CREEK PARK
108
97
540
470
530
FEEDER BUS NETWORK
ALTERNATIVE 2
NORTHERN SECTION




# FEEDER BUS NETWORK
# ALTERNATIVES 1 & 2
# SOUTHERN SECTION


# Appendix D
# Estimates of Transit Ridership

September 9, 1997

**MEMORANDUM**

TO: Alex Hekimian
cc: Eric Graye
FROM: Yuanlin Huang
SUBJECT: Estimating Transit Ridership (Revised on Sep. 9)

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This memo consists of three parts: A proposed procedure to estimate the ridership with additional information outside the Travel/2 model to compensate for biased transit access time; 2) Estimation of Georgia Busway Ridership; and 3) Sensitivity Analysis of riderships with various possible scenarios.

## Part 1: A Proposed Procedure

### 1.1. Estimate Total Trips within Potential Transit Market

GIS can be used to estimate all population within 1/4 miles of transit lines. Total trips can be, thus, estimated based on population and trip generation rate:

total trips = trip rate * population
= trip rate *households*household size
=0.37*households*3.3
=1.22*households

where:

trip rate = 0.37 pm pk pd home trips per person, based on COG and MC Travel Survey
household size = 3.3 in Olney Planning area, according to Travel/2 database

### 1.2. Estimate Transit Mode Share

For 2010, transit mode share based on accessibility (auto vs transit time/accessibility, from centroid vs from within 1/4 mile) is

$$\text{Transit mode share} = \frac{1}{[1+(I_t/I_a)^b]}$$

$$= \frac{1}{[1+(39.41/28.72)^3]}$$

$$= 0.28$$

where:

b = 3, according to Quick-Response Urban Travel Estimation Techniques and Transferable Parameters, p82.

$I_t$ = 44.41-5=39.41, transit trip time, use transit trip time estimated from Travel/2 and revise it with 5 minutes access time correction.

$I_a$ =28.72, auto trip time, estimated from Travel/2.

1.3. Estimate Percentage Transit Riders using Georgia Busway

Estimate the total transit riders in Olney area and those busway riders from Olney.

percentage riders using Busway = (total trips from Olney to Glenmont Direction/total trips from Olney)

= 581/2188
= 0.266

Where:
total trips from Olney to Glenmont Direction =581, according to 1994 Census Update Survey
total trips from Olney = 2188, according to 1994 Census Update Survey

1.4. Estimate Busway Riders

Busway riders = Total trips * Mode share * Percentage on Busway
= 1.22 * households * 0.28 * 0.266
= 0.091 * households

**Part 2. Estimation of Georgia Ave Busway Ridership**

2.1 Estimated Ridership

| Name | Number of Households (DU) | Busway Transit Riders (=0.091*# of DUs) |
|---|---|---|
| Route 1 | 2127 | 194 |
| Route 2 | 3444 | 313 |

| | | |
|---|---|---|
| Route 3 | 2372 | 216 |
| Route 4 | 1588 | 145 |
| Route 6 | 3233 | 294 |
| Route 7 | 5356 | 487 |
| *Upper Route* | *7252* | *660* |
| *Lower Route* | *8220* | *748* |
| Total | 15472 | 1408 |

Note: total households in Olney planning area is 11,905, according to Travel/2 database.

Busway riders = 0.091 * households
= 0.091 * 15472
= 1408

2.2. Daily Passenger Miles Traveled (PMT) Per Line Mile

PMT is a widely used measure of effectiveness. Since PM peak to daily conversion factor for Georgia Avenue is 0.25, based on WMATA ridership data (=1,700/6,687); and the average trip length is about 6 miles; the PMT per line mile of the 8.7 mile busway is therefore:

{[(1408/0.25)*6]/8.7}=3884 (>2,600 threshold value)

**Part 3. Sensitivity Analysis**

3.1 Scenario 1 (Optimistic Scenario)

Assume all residents cluster around express bus stops in Olney area and work at offices in Glenmont station area. Their door-to-door travel time may be approximated by line-haul travel time between Olney and Glenmont. According to a previous study, the line haul travel time between Olney and Glenmont station during the peak hour in the peak direction is 30 minutes by car and 24 minutes by express bus. Thus, we have:

$$\text{Transit mode share} = \frac{1}{[1+(24/30)^3]}$$

$$= 0.66$$

Busway riders = Total trips * Mode share * Percentage on Busway
= 1.22 * households * 0.66 * 0.266

= 0.214 * households
=0.214*15472
=3311

PMT per line mile ={[(3311/0.25)*6]/8.7}=9133 (>2,600 threshold value)

3.2 Scenario 2 (Conservative Scenario)

Assume average transit access time is 10 minutes, which is the current average, at each end; and the waiting time is 5 minutes, which correspond to 10 minutes headway. The door to door trip time by express bus is therefore,

$I_t = 10 + 5 + 24 + 10$
$= 49$

Thus, we have:

$$\text{Transit mode share} = \frac{1}{[1+(49/30)^3]}$$

$= 0.19$

Busway riders = Total trips * Mode share * Percentage on Busway
= 1.22 * households * 0.19 * 0.266
= 0.214 * households
=0.0617*15472
=953

PMT per line mile ={[(953/0.25)*6]/8.7}=2631 (>2,600 threshold value)

3.3 Scenario 5 (5 minutes access time)

Assume average transit access time is 5, instead of 10 minutes; and the waiting time is 5 minutes, which correspond to 10 minutes headway. The door to door trip time by express bus is therefore,

$I_t = 5 + 5 + 24 + 5$
$= 39$

Thus, we have:

$$\text{Transit mode share} = \frac{1}{[1+(39/30)^3]}$$

$= 0.31$

Busway riders = Total trips * Mode share * Percentage on Busway
= 1.22 * households * 0.19 * 0.266
=1554

PMT per line mile ={[(1554/0.25)*6]/8.7}=4290 (>2,600 threshold value)

3.4 Scenario 4 (10 minutes headway)

Assume the transit and auto trip times in Section 1.2, but 10 minutes headway instead of 6 minutes headway that is implemented in the model. This 4 minutes longer headway results in 2 minutes more average waiting time. Revising the door to door trip time by express bus accordingly, we have:

$I_t = 39.41+2$
$= 41.41$

And the auto trip time is:

$I_a = 28.72$

Thus, we have:

$$\text{Transit mode share} = \frac{1}{[1+(41.41/28.72)^3]}$$

$$= 0.25$$

Busway riders = Total trips * Mode share * Percentage on Busway
= 1.22 * households * 0.25 * 0.266
= 1257

PMT per line mile ={[(1257/0.25)*6]/8.7}=3461 (>2,600 threshold value)

3.5 Scenario 5 (15 minutes headway)

Assume the transit and auto trip times in Section 1.2, but 15 minutes headway instead of 6 minutes headway that is implemented in the model. This 9 minutes longer headway results in 4.5 minutes more average waiting time. Revising the door to door trip time by express bus accordingly, we have:

$I_t = 39.41+4.5$
$= 43.91$

And the auto trip time is:

$I_a = 28.72$

Thus, we have:

$$\text{Transit mode share} = \frac{1}{[1+(43.91/28.72)^3]}$$

$$= 0.22$$

Busway riders = Total trips * Mode share * Percentage on Busway
= 1.22 * households * 0.22 * 0.266
= 1106

PMT per line mile ={[(1106/0.25)*6]/8.7}=3046 (>2,600 threshold value)

3.6 Scenario 6 (20 minutes headway)

Assume the transit and auto trip times in Section 1.2, but 20 minutes headway instead of 6 minutes headway that is implemented in the model. This 14 minutes longer headway results in 7 minutes more average waiting time. Revising the door to door trip time by express bus accordingly, we have:

$I_t = 39.41+7$
$= 46.41$

And the auto trip time is:

$I_a = 28.72$

Thus, we have:

$$\text{Transit mode share} = \frac{1}{[1+(46.41/28.72)^3]}$$

$$= 0.19$$

Busway riders = Total trips * Mode share * Percentage on Busway
= 1.22 * households * 0.19 * 0.266
= 955

PMT per line mile ={[(955/0.25)*6]/8.7}=2630 (>2,600 threshold value)


# Appendix E
# Cost Estimate Summary

## Capital Cost Estimate Summary

| BUSWAY ALTERNATIVE | PROJECT PLANNING | PRELIMINARY ENGINEERING | RIGHT-OF-WAY | CONSTRUCTION | TOTAL | ROUNDED TOTAL | ROUNDED TOTAL (low range) | ROUNDED TOTAL (high range) |
|---|---|---|---|---|---|---|---|---|
| Center (1-lane) (Express only) | $280,750 | $2,878,000 | $11,597,400 | $35,000,000 | $49,756,150 | $49,800,000 | $47,400,000 | $52,300,000 |
| Center (2-lane) (Express and Local) | $280,750 | $2,901,317 | $11,597,400. | $40,319,564 | $55,099,031 | $55,100,000 | $52,400,000 | $57,900,000 |
| Median-Side (Take-a-lane) | $280,750 | $402,140 | $8,868,600 | $5,588,528 | $15,140,018 | $15,200,000 | $14,500,000 | $16,000,000 |
| Median-Side (Add-a-Lane) | $280,750 | $2,418,880 | $12,961,800 | $33,615,138 | $49,276,568 | $49,300,000 | $46,900,000 | $51,800,000 |
| Curb-Side (Take-a-Lane) | $280,750 | $402,140 | $8.868,600 | $5,588,528 | $15,140,018 | $15,200,000 | $14,500,000 | $16,000,000 |
| Curb-Side (Add-a-Lane) | $280,750 | $2,418,880 | $1,961,800 | $33,615,138 | $49,276,568 | $49,300,000 | $46,900,000 | $51,800,000 |
| Contra Flow (Express only) | $280,750 | $726,644 | $9,550,800 | $10,098,158 | $20,656,352 | $20,700,000 | $20,700,000 | $21,800,000 |

*Note: The center busway options assume reconstruction of Georgia Avenue in order to fit as much of the preferred cross-section as possible within the existing right-of-way

# Bus Vehicle Cost

| FREQUENCY | Total Buses per Hour | Total Buses in Peak | Unit Cost | Total Cost |
|---|---|---|---|---|
| 6 Minutes | 60 | 78 | $150,000 | **$11,700,000** |
| 10 Minutes | 36 | 48 | $150,000 | **$7,200,000** |
| 15 Minutes | 24 | 33 | $150,000 | **$4,950,000** |
| 20 Minutes | 18 | 26 | $150,000 | **$3,900,000** |

## Operating and Maintenance Cost

| Frequency | Platform Hours | | | Vehicle Hours | | | Vehicle Miles | | | Passenger Boardings | | | TOTAL COST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number | Unit Cost | Cost | Number | Unit Cost | Cost | Number | Unit Cost | Cost | Number | Unit Cost | Cost | |
| 6 Minutes | 109,598 | $28.54 | $3,127,914.74 | 120,557 | $8.57 | $1,033,176.32 | 2,344,001 | $1.71 | $4,008,242.49 | 1,408 | $0.05 | $70.40 | **$8,169,404** |
| 10 Minutes | 75,528 | $28.54 | $2,155,579.77 | 83,081 | $8.57 | $712,005.98 | 1,505,849 | $1.71 | $2,575,001.32 | 1,408 | $0.05 | $70.40 | **$5,442,657** |
| 15 Minutes | 58,184 | $28.54 | $1,660,583.92 | 64,003 | $8.57 | $548,504.72 | 917,455 | $1.71 | $1,568,847.27 | 1,408 | $0.05 | $70.40 | **$3,778,006** |
| 20 Minutes | 50,512 | $28.54 | $1,441,623.71 | 55,564 | $8.57 | $476,180.33 | 764,545 | $1.71 | $1,307,372.73 | 1,408 | $0.05 | $70.40 | **$3,225,247** |


# Appendix F
# Additional Focus Group Comments

# *FIRST SERIES OF FOCUS GROUP SESSIONS*

## *1st Session*

- There are problems and issues related to busway's impact on turning traffic movements
- Put transit underground
- Manage transportation assets
- Line haul busway needed
- Stage bus to LRT
- Land use approach process needed
- What about today's problems? Problem is now.
- There are more corridors and trips than Olney to Wheaton
- Better coordination between train arrival and buses needed
- Do anything to get people on buses
- There is a crime factor - waiting at stops
- Make transit convenient
- The Toronto system has frequent service; meets right at train
- More people would use the bus if there were minimal delays
- It is expensive to ride current system
- How do you get people into system quickly?
- Need to handle multiple purposes and times during hours of bus operation
- Convert a lane
- Maintain Olney's satellite community status; expect low ridership, low revenues - that's okay
- Educate public on costs of transit versus driving
- Education needed on how to ride bus
- Make fare payment easy - passes, etc.
- Bus still has some air quality impacts
- Consider operating expenses
- Combine local and line haul; connect to other systems
- Make busway attractive through time/headways, connectivity
- There are "danger zones" due to lane changes when bus stops are in general purpose lane
- Enforce on-street parking
- Aesthetics are important; add trees, greenery
- Make sure lights are timed to protect pedestrians

- Put pedestrian-overpasses into median stops
- The size, looks, pedestrian access of the Olney busway terminus are important
- Need pedestrian amenities
- Are there any studies on air pollution comparing cars and diesel buses?

## *2nd Session*

- Consider bus through neighborhoods and relationship to bus run time
- Question HOV/Busway benefits, particularly when taking away a lane
- Concerned about underutilized HOV facilities - many cars are "SOV"
- Concerned about added trip time to make connections/walk between bus and train
- There is unproductive time sitting in car in traffic
- Busway is better by reducing number of connections
- Consider lifestyle issues - store, day-care constraints
- Busway is not enough - extend Metro to Olney
- Consider "Bus Buddies"
- Examine trip expenses
- Cost of driving versus taking transit is an issue
- Keep intersection and transit options in mind when developing improvements
- Recognize work style - working more than an eight-hour day, etc.
- Do we know who will use it? Are there market surveys?
- Pedestrian movements across Georgia Avenue and safety are issues
- Pedestrian signals timed to allow reasonable crossing times are needed
- Existing sidewalks are not friendly - not wide enough, too close to travel lanes
- Existing stops are not acceptable - only signs, no shelters
- Sidewalks should accompany all road improvements - put into law
- Safe access to bus stops are needed
- With center busway, pedestrians only cross half the road
- Center busway may promote more pedestrian crossings
- Would center lane use be based on time of day?
- Do not like Take-a-Lane option
- Take-a-Lane creates enforcement issues
- Preserve quality of life
- Make sure right-turn lane works with turn movement and bus

- What is today's "Transportation Culture" - what is the current mind set?
- Bus stop shelters must be handicap accessible
- Busway should incorporate bus/transit services; amenities should include utilizing current lots as pull-offs, well lit areas
- Consider transfers - reuse; all-day transfer; all-day passes
- Consider one payment system - Ride-On, Metrobus, Metrorail
- Provide services for more than just the commuter
- Sidewalks, trails, trees are all positives, wants
- In the short-term, pull-out needed at southbound Georgia just south of Norbeck Road
- Examine left turns across center busway - effects to side streets
- Consider pros/cons of bus pull-outs
- Must have an express lane for buses - signal control
- Too much emphasis on undocumented need - concerns over using median
- Convenience is important
- Busway is an important addition to future options
- Need is coming for better park-and-ride lot at Georgia and Norbeck
- Bus may not be the answer for 21st century - questions of ridership and usage
- Bus is not the only answer - bus is flexible; need market solutions
- Do not want to lose right-of-way from community
- What is effect/impact on transportation system, intersections?
- Provide a convenient, viable option

## *3rd Session*

- Don't want to limit options - such as LRT
- Call it a transitway
- LRT is pollution free
- Like the fixed permanent nature of LRT
- Combine small buses (natural gas) neighborhood circulation with line haul LRT
- Options must be "sold" on time savings
- Timing of connections between systems is important
- Do not convert a lane
- Stop cars at intersections to allow bus to move without stopping (true express service)
- Transit oriented development is needed
- Property values are higher with LRT than at highway locations

- A lot of sidewalks are needed
- A lot of landscaping is needed
- Don't let Georgia Avenue become community edge, make it the community center
- Do not want this to be an excuse to increase land use density
- Larger buses on Georgia Avenue and small feeder buses in neighborhoods are needed
- Number of transfers needs to be kept to a minimum
- Cost to transit user is important consideration
- Will this service impact east-west movements?
- Multi-use passes - monthly, etc. are needed
- Cost of and availability of parking is a related issue
- Transitway gives Olney "Town Center" status
- Make sure service is two-way operation
- Have mid-day, evening, weekend service
- Make sure this transitway ties into a system connecting desired trip destinations
- Stage based on need
- What are impacts to people living on Georgia Avenue from trips beginning farther away
- Examine right-of-way impacts
- Favor taking a lane - easier for bus, harder for car
- Take a lane for LRT
- Smaller lanes (width, number) make road pedestrian friendly
- Is shared use - car and LRT in lane - possible?
- Center busway is important - use shared lane in tight right-of-way areas
- Pedestrian bridges are needed
- Perform cost benefit analysis
- Consider center lane overpass/underpass to free movements through intersections
- Make center lane for HOV as well
- Get people out of cars and into public transportation
- Need affordable and fast/efficient transit, with incentives
- Consider auto dis-incentives - gas tax, toll road
- Make sure improvements take all interests into account - auto, transit
- Use positive incentives; don't separate communities
- Keep LRT option open; take away a lane to implement; larger transit subsidies are needed
- Adding a lane is not the solution; use center area first; time element is a key factor; minimize transfers; take a lane may prove incentive to get into transit

- Balance positive and negative incentives
- Buses should be free

## *SECOND SERIES OF FOCUS GROUP SESSIONS*

### *Session #1*

### *General*

- Move end of busway north of Olney in order to capture riders early
- Why not light rail?
- There may be ridership coming from Howard County rather than the Georgia Avenue corridor that would support rail
- Park-and-ride location suggestions:
  -place it north of study area (Brookeville) green space to capture riders; but Brookeville residents may oppose it
  -better to put it near commercial uses in Olney
- Other possible areas for a park-and-ride lot:
  - Longwood Recreation Center
  - Overflow lot on Georgia Avenue, near entrance to Longwood Recreation Center
  - Opposed to using park for parking facilities
  - Church parking lots
  - Shopping center parking lots
- Park-and-ride lot size is an issue
- Start busway at Norbeck Road, initially, to see how it works; extend to Olney later
- Enforcement of bus lanes is an issue
- Can you integrate HOV into busway?
- Suggest road modification to accommodate bus wheel base and discourage cars. Police enforcement is ongoing expense with HOV lanes.
- Add lane - add capacity
- Take-a-Lane is a transit incentive; avoids sprawl
- Busways work better with take a lane because of disincentive to drive.
- Take-a-Lane makes sense for rush hour
- Hiker/biker trail is waste of taxpayer money. Don't make busway bicycle-compatible because it's not cost efficient
- Hiker/biker trails are essential and compatible
- 24-hour dedicated bus lane better because doesn't create driver confusion
- Take-a-Lane may negatively influence County's Adequate Public Facility ordinance
- Have express bus only; local bus too slow
- Take existing lanes for busway
- Against sprawl - taking away a lane adds to the potential success

- Like idea of Light Rail - connect to Rockville Metro
- Median is nice but do not need all the trees; more grass
- Government should solve the problem based on what's most economical; question is what the government should be doing and why? (Strong Purpose and Need for study is needed)
- Is there really a problem? Who should solve? Do we need to fix?
- What is the most economical way?
- Can't add more cars
- Intersections are critical - provide overpass/underpass
- Take into account emergency vehicle access

***Curb Side Busway***

- Take a lane at curb during the peak period only
- Take a lane at curb all day to avoid confusing public
- Peak period use only becomes an enforcement issue
- Enforcement of general use access from driveways is an issue
- It is hardest to enforce

***Median Side Busway***

- Crossing access is a potential problem; cars making left turns out of neighborhoods would interfere with bus lane
- It's not for local service; better for express service
- Transfers are more difficult

***Center Busway***

- Transit suffers when center lane is shared with HOV
- What should be the width of center busway?
  - It would not be economical if there is lack of use
  - It is very economical because available right-of-way makes this option cheaper
- Most easily expanded to future light rail options
- May contribute to sprawl by not taking lanes
- Against HOV sharing center busway; transit ridership suffers
- Make center lane available to HOVs; provides alternative transit and cleaner air
- Support this scenario because it has future flexibility and most closely resembles rail transit in physical dedication
- Center busway is preferred

***Contraflow Busway***

- Can we take the lane from off-peak direction; is there enough of a difference in directional flows?
- Use signs as opposed to concrete barriers
- Barriers are "ugly"; prefer signs to indicate lane direction changes
- People adapt to median opening closures; if you close median openings, people won't like it but will adjust

- Not a viable alternative because must move barriers which requires special signing.
- There are pedestrian safety issues
- Enforcement may or may not be a problem

## *Session #2*

### *General*

- Favor Add-a-Lane because doesn't think busway will have enough passengers to solve congestion problem.
- May not be able to take a lane as it does not solve problem
- Local buses, by their presence, are already somewhat taking a lane adjacent to curbs
- Drivers tend to avoid buses in curb lane, anyway
- Take-a-Lane is tough but cheap
- Take-a-Lane is least desirable, but may be less expensive
- Add lane and operate during peak period only
- Mid-block shopping areas will be upset with loss of access
- Don't forget the local users
- Provide skip stop service as an option
- Feeder bus would help get people to use busway, but still doesn't warrant taking a lane
- Add-a-Lane plus feeder bus would be best for peak period. Off-peak extra lane would be helpful, mixed traffic
- Support separate bike trail from vehicle traffic and pedestrian sidewalk
- Feeder routes and park-and-ride lots are logical and already in use by WMATA – suggest that Olney have them
- Existing Norbeck Road Park-and-Ride Lot hard to see and tricky to access
- Can't think of an existing shopping center on Georgia Avenue in Olney that has a large enough parking lot for busway and shopping center use.
- Makes sense to put feeder routes where the people live
- Support loop rather than linear feeder since bus circulates through more territory in neighborhoods and makes bus easier to use
- Linear feeders are more direct than loop routes and avoid back-tracking for some passengers
- Support feeder buses that pick up passengers in neighborhoods and use center bus lane to go "express" to destination. Still would have local bus service for those people who want to access businesses/neighborhoods along Georgia Avenue.
- Still like Add-a-Lane as it addresses several transportation issues and not just the busway to accommodate future development.
- Add a lane addresses many transportation issues
- Norbeck Road's boulevard style landscape serves as a great example for Georgia Avenue landscaping
- Likes feeder service concept
- Express during peak period and general use during off peak make sense

- Add-a-Lane curb side addresses multiple issues and is easy to adapt to users

***Curb Side Busway***

- Could be least expensive and easiest for the public to accommodate

***Median Side Busway***

- It is similar to curb side. Could put local buses on curb lane and express buses in bus lane or use buses with left-side doors.
- The problem is getting pedestrians to the median lane to board bus

***Center Busway***

- Closing medians would negatively affect strip commercial and neighborhood access
- Support it because gets bus out of the way. Maybe a "hybrid" would be acceptable to public and use center busway where sufficient ROW and Take-a-Lane in those areas of Georgia Avenue that don't have sufficient ROW.
- It is also flexible to accommodate light rail in future if necessary.
- Busway presumes only work trips between Olney and Wheaton. Doesn't accommodate neighborhoods in the "middle" between these two points. However, can provide local stops if there are bus pullouts ("skip stop" service)
- Single reversible lane could be confusing if it changes bus stop locations according to peak/non-peak hours for non-English speaking citizens and others.
- Put center busway where it fits - adjust limits
- Center busway best expands to future options
- Center busway is least disruptive; use existing median; change limits; think of system as "giant oak", fix it right once, easier to expand

***Contraflow***

- Entails high costs
- Involves cumbersome process to move barriers twice a day; difficult set up
- Cost may be high
- It still requires pedestrians to be in the "middle" of the street
- It may be better than curb side or median side Take-a-Lane
- In general there are negative reactions to this alternative

## *Session #3*

### *General*

- Metro would be baseline for any improvement to busway.
- Shouldn't travel times be studied between Olney and Wheaton rather than Silver Spring?
- Is there any time frame for development of this project?
- Are two lanes adequate for future transportation needs? Has traffic modeling been done? What is current peak hour split?
- What is timing of study and timing for additional follow-up studies (SHA, MCDOT)?

- Do it right the first time for the long term future - do not build incrementally
- Could this be an HOV lane too? Can the mix work?
- Use Take-a-Lane to change behaviors
- Need better connections
- Need combinations of alternatives - sensitive to community with an effective busway
- Provide a park-and-ride lot at Aspen Hill
- Have concerns about potential users
- Better define operations
- Implement service timing to match needs - guarantee ride home
- Why not rail?
- Appropriate parking is needed
- What is the right mix to best serve the corridor? Bus, more lanes and more parking are needed
- Need is low - only 4200 riders
- Be cautious about setting aside right-of-way as it "sets process in motion"; becomes quoted in master plan
- Doesn't see need for hiker/biker trail that will impact residents more
- Sees possibility of people using bikeway to access Metro stations
- May be good "public" trade-off to add landscaping and more transportation alternatives along Georgia Avenue
- Use Take-a-Lane in areas where there is enough available ROW, and use another less disruptive method (like contra-flow) in areas where there is less ROW
- Why not use trolley?
- Circulate buses in communities south of study area
- Make better use of the Norbeck Road Park-and-Ride Lot
- Olney shopping center is excellent location for park-and-ride
- Ridership is an issue overall for transit (only expected to serve 10% of people traveling along Georgia Avenue and may not be cost-efficient)
- Transit works better in Europe because of more transit stops in close proximity to activity areas. We need better connections.
- Need functional park-and-ride lots
- Make solutions comprehensive
- Need alternative transportation modes like this busway (make comprehensive solutions)
- Do people want feeder buses in neighborhoods at all hours of the day?
- Access to Norbeck Road Park-and-Ride Lot needs to be improved
- Need a busway connection at Connecticut Avenue
- Start something now in association with the Glenmont Metro opening
- Start public education now

- Do not need circulator/feeder bus
- Emphasize park-and-ride facilities
- What are busway projections?
- Multiple entrances and exits for existing and proposed park-and-ride lots are needed
- Put in facility with least amount of impact
- Cheaper to run facility with larger buses
- There must be a way to move people in buses - how do these facilities expand into future options?
- Schedule and convenience of driving are issues if not enough parking spaces exist at park-and-ride lots
- Not sure if busway is right solution because of cost effectiveness issue
- Agree with acquiring ROW for future transportation however, afraid that will serve as the justification for a particular alternative. Also, concerned with more bus traffic near neighborhoods
- Start marketing busway at Glenmont station to get people use to idea
- Favor busway if accompanied by good public education
- Favor any means to get people on public transit
- Favor public transit, and must remember elderly population in the future.
- Be realistic rather than make large projects that never come to fruition
- Do something now

***Curb Side Busway***

- If had HOV bus lane, people would follow bus; suggest put a traffic light in lane to allow HOV vehicle to let bus back into lane (like in Europe)
- Take-a-Lane curb side busway would encourage transit use. Combination HOV/bus lane would move faster.
- Favor Take-a-Lane curb side busway because it will force people to use transit
- Suggest local bus in curb side lane and express bus/HOV lane as separate lane
- Prefer the curb side option, use Chestnut Street in Philadelphia as an example
- Favor curb side busway

***Median Side Busway***

- Safety is an issue
- Need more park-and-ride lots between Aspen Hill and Glenmont to accommodate this scenario.
- Looks better than curb side

***Center Busway***

- Median crossings are an issue
- Local bus can stay curbside
- Need to find a suitable alternative to possible median closures
- How does another bus get past a broken down bus in the center lane?

- One lane reversible is not practical to use for local service, but is OK for express
- Need to figure out a solution for people if median cross-overs are closed
- Believe negatives of center busway outweigh positives
- Suggest two bus lanes in center of Georgia Avenue between Olney and Glenmont to accommodate long-term future transportation needs and also only disrupt adjacent residents once.
- Reversible bus lane would lessen impact to adjacent residents (be sensitive to residents).
- Congestion will require some type of transit between Olney and Norbeck Road. Need center bus lane with left turn lane to serve park-and-ride lots

*Contraflow Busway*

- Safety is an issue; are there any statistics for existing facilities?
- Why does it have to be concrete barrier?
- Use signal lights instead of moveable barriers
- Keep it simple - reduce operation costs
- Snow removal is an issue
- Make contraflow lane wider instead of including a hiker-biker trail
- Operating and maintenance cost is an issue
- Contraflow is bad design because it isn't easily understandable to new visitors, people who don't read English, etc.
- Left-turn and access to bus are issues, but contraflow lanes are less expensive and quicker to implement
- Avoid reliance on "zipper" machine that moves barriers
- Can off-peak direction handle taking a lane for contraflow?
- Contraflow approaches best of both worlds
- Contraflow has least amount of impact to adjacent residents

# Acknowledgments


## Montgomery County Department of Park and Planning

Charles R. Loehr, Director of the Department of Park and Planning
Jeffrey Zyontz, Acting Chief, County-wide Planning Division
Richard C. Hawthorne, P.E., Transportation Planning

## Project Team

Alex Hekimian, Study Manager, Transportation Planning

John Matthias, Transportation Planning
Yuanlin Huang, Transportation Planning*
Ivy Leung, Transportation Planning
Donald Downing, Community Based Planning -- Georgia Avenue Team
Marilyn Clemens, Community Based Planning -- Georgia Avenue Team
Joseph Anderson, Environmental Planning

## Technical Staff

Katherine Woodworth, Transportation Planning
Charles Coleman, Management Services

## Agencies Represented on the Technical Advisory Committee

Montgomery County Council
Montgomery County Department of Public Works & Transportation
Mid-County Services Center
State Highway Administration
Mass Transit Administration
Washington Metropolitan Area Transit Authority
Metropolitan Washington Council of Governments


* Formerly with the Commission

The Maryland-National Capital
Park and Planning Commission
8787 Georgia Avenue
Silver Spring,
Maryland 20910-3760