



Network and Methodology Report - Countywide Transit Corridors Functional Master Plan

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Description

This report documents the evaluation of the 16 corridors in the MCDOT Countywide Bus Rapid Transit Study and recommends modifications to that network. It also recommends a methodology for determining bus treatments that will be used to define where additional public right-of-way will be needed. This Functional Plan is intended to facilitate the development of a countywide bus rapid transit (BRT) system and supersedes the Master Plan of Highways Bus Rapid Transit Amendment effort.

This Functional Master Plan will amend the General Plan, of which the Master Plan of Highways is a part, as well as all the affected area Master and Sector Plans. As part of this Amendment to the General Plan, the name of the Master Plan of Highways will change to the Master Plan of Highways and Transitways.

Summary

The Board’s action today is to decide what BRT network should be evaluated further for inclusion in the Countywide Transit Corridors Functional Master Plan. The Board is also to decide whether the recommended methodology should be used to determine when dedicated bus lanes are desirable and when those lanes should be achieved by repurposing existing travel lanes. The Planning Board’s recommendations will be forwarded to the County Council for approval.

Recommendations for transmittal to the County Council

Transit Corridor Network:

1. The corridors recommended by the MCDOT Feasibility Study should be carried forward for further evaluation as part of this Functional Plan, with the exception of the ICC and Midcounty Highway corridors.
2. The following corridors are recommended to be added to the scope of work for this Functional Plan, which will require additional resources and time to complete:

- a. Two corridors should be added to the scope of work for this Functional Plan to provide better coordination with the White Oak Science Gateway Master Plan effort:
 - i. New Hampshire Avenue from US29 to Randolph Road, and
 - ii. Randolph Road from Georgia Avenue to US29

- b. Three corridors should be added to the scope of work for this Functional Plan to provide better east-west connections in the BRT network:
 - i. A connection between the Rockville Metrorail Station and the Georgia Avenue interchange for the ICC, by way of MD 28/Norbeck Road
 - ii. A connection between NIH and Wheaton, by way of the following roads: Cedar Lane, Summit Avenue, Knowles Avenue, Connecticut Avenue, and University Boulevard
 - iii. A connection between Aspen Hill and White Flint, by way of Parklawn Drive and Montrose Parkway

- c. Seven corridors have been recommended by the Executive to be added to our scope of work for this Functional Plan:
 - i. An extension of Old Georgetown Road from Tuckerman Lane north to White Flint
 - ii. An extension of Wisconsin Avenue (MD355) south from the Bethesda Metrorail Station to the District of Columbia Line
 - iii. An extension of MD355 from the terminus of the CCT in Clarksburg to the Frederick County Line
 - iv. An extension of US29 from the Burtonsville park-and-ride to the Howard County Line
 - v. Cherry Hill Road from US29 to the Prince George's County Line
 - vi. Georgia Avenue from the Silver Spring Transit Center to the District of Columbia Line
 - vii. A corridor from the Montgomery Mall Transit center to the American Legion Bridge via I-270 and I-495.

- 3. Within the limits of the Cities of Gaithersburg and Rockville, we are retaining BRT corridor segments for further study to the same level of detail as the rest of the proposed network. Should they desire changes in the network, the Cities should communicate their request to the County Council for consideration in conjunction with your review of this report.

- 4. This Functional Plan will include recommendations only for those transit corridors where dedicated transitways and intersection improvements are warranted and can be achieved, as well as those with enhanced stations that require additional right-of-way. Corridors where only operational improvements are needed (no additional right-of-way and no change in the number of travel lanes) will not be included.

Proposed Methodology:

5. The methodology shown in Chapter 4 of the Network and Methodology report should be used to determine the preferred treatment, and the right-of-way for that treatment, for the final transit corridor network to be included in the Functional Plan.
6. A tiered approach will be used to identify the level of investment appropriate for each corridor, based on its ridership forecasts. This approach is illustrated on page 23 of the report.
 - a. Tier 1 Corridors: Exclusive Transitway Treatments
Corridors with peak hour passenger volumes in 2040 exceeding 800 in urban areas and 1,200 in suburban areas would be evaluated for exclusive transitway treatments. Changes to the master plan would include modifications to the number of general purpose lanes, and the provision of bus lanes, and requirements for additional right-of-way for exclusive transit lanes, some intersections, and stations.
 - b. Tier 2 Corridors: Bus Priority with Spot Right-of-Way Requirements
Corridors with peak hour passenger volumes in 2040 between 500 and 800 in urban areas and 700 and 1,200 in suburban areas would operate in mixed traffic and would be evaluated for bus priority, including queue jumps and transit signal priority. Changes to the master plan would include additional right-of-way at some intersections and stations.
 - c. Tier 3 Corridors: Bus Priority
Corridors with peak hour passenger volumes in 2040 less than 500 in urban areas and 700 in suburban areas would operate in mixed traffic and would be evaluated for bus priority, including transit signal priority. Changes to the master plan would include additional right-of-way at stations only.
7. The conversion of an existing travel lane to a bus lane is preferred to constructing an additional lane for corridors where passenger volumes exceed single lane person-throughput in automobiles, as long as the volume-to-capacity ratio on the remaining travel lanes is less than 1.0 under 2040 conditions.
8. The corridor typology will be used to determine the preferred number of exclusive lanes for each corridor, rather than assuming that a two-lane transitway is appropriate for all corridors. Activity Center Connector corridors would be evaluated for two-way busways and Commuter/Express corridors would be evaluated for one-way busways.

Additional Analysis:

9. Additional funds and resources should be allocated to provide greater certainty about potential BRT ridership and a better understanding of the traffic impacts associated with BRT implementation.

- a. Additional travel demand forecasting is needed to add more specific technical detail to the model effort conducted for the MCDOT feasibility study and improve our findings. This modeling includes the following:
 - i. Updating the model to reflect local bus network improvements underway for the Corridor Cities Transitway project
 - ii. Reflecting refined station locations
 - iii. Updating land use assumptions to reflect recently approved and ongoing master planning efforts
 - iv. Updating assumptions for transitway design treatments
 - v. Updating assumptions based on the anticipated level of local bus service after implementation of the BRT network.
 - vi. Updating MARC future ridership based on MTA’s proposed facility improvements and the planned White Flint MARC station

- b. Additional technical analysis would also contribute to policy discussions associated with this Functional Plan. That analysis includes the following:
 - i. Conducting analysis to determine impacts of a lane repurposing policy on the roadway network
 - ii. Understanding the mode choice implications of a lane repurposing policy to estimate how many people would be expected to shift to transit if roadway conditions were to become more congested
 - iii. Conducting forecasts on additional corridors identified by the Rapid Transit Task Force for an expanded network and by Planning Board to improve east-west travel options
 - iv. Developing a final network, which incorporates all final policy recommendations to determine new ridership estimates for the transit corridor network

MARC

10. As part of a broader response to the question of what modifications should be made to the County’s transit network, we recommend that you consider adding an evaluation of the Maryland Transit Administration's MARC Growth and Investment Plan’s recommendation for a third track along the CSX line between Kensington and the Montgomery County/Frederick County line to our work program as a separate master plan amendment.

Overview of Analysis

This memo summarizes the highlights of the attached *Network and Methodology Report* prepared by Planning staff and PB Engineering, our consultant in this effort. This report helps frame key decisions and includes the background and context of the Countywide Transit Corridors Functional Master Plan. The Plan will recommend adequate rights-of-way in the Master Plan to facilitate the development of a countywide Bus Rapid Transit system. This includes identifying:

- corridors where dedicated bus lanes are needed
- intersections where queue jumpers are needed
- station locations

The Network and Methodology Report is an important step in developing the Functional Plan as it:

- establishes the network to be evaluated
- identifies the decision-making process that will recommend appropriate treatments for each corridor.

This effort was originally entitled the BRT Amendment to the Master Plan of Highways, but it became clear early in our work that the majority of elements that make a BRT system a success are operational issues that are beyond the scope of the Master Plan. For example, the Master Plan can't require that buses come every 10 minutes for 14 hours a day, an important characteristic of a high-level BRT service.

Transit Corridor Network

Recommendation #1: The corridors recommended by the MCDOT Feasibility Study should be carried forward for further evaluation as part of this Functional Plan, with the exception of the ICC and Midcounty Highway corridors.

The ICC corridor should be removed because it would function as express service rather than BRT service. Additionally, bus service would operate along a tolled, high-capacity facility whose toll rates are intended to keep the facility congestion-free, negating the need for dedicated bus lanes. The Maryland Transit Administration already operates two commuter express bus routes along the ICC and will expand this service to five routes in January 2012.

The Mid-County Highway corridor should be removed because it appears to compete with both the Corridor Cities Transitway and Corridor 10b/MD355 North. If built in the master planned alignment, it would function as express service similar to the ICC.

The fourteen remaining corridors will be carried forward for further evaluation.

Recommendation #2: The following corridors are recommended to be added to the scope of work for this Functional Plan, which will require additional resources and time to complete.

Outlined below are a number of potential additions to our approved scope of work that would expand the BRT network to be studied, in part to provide a better coordination with our Master Plan program. All of these items would require additional time and would require additional personnel and consultant resources to complete this Functional Plan. If the Board concurs that this additional work is needed, we will prepare a cost estimate and revised schedule for the Council's consideration. If approved, these corridors would be added for evaluation.

White Oak Science Gateway (WOSG) Master Plan: The Functional Plan is currently on essentially the same schedule as this WOSG Master Plan effort. It is anticipated that the WOSG plan will consider a much higher level of density than the current Master Plan and its modeling will include BRT as a way to serve this development. The modeling for these corridors is not in our current scope for the Functional Plan however. We recommend that the Board endorse adding these corridors to our scope of work:

- Randolph Road: an extension from its current terminus in Glenmont to White Oak
- New Hampshire Avenue: from its current terminus at US29 to Randolph Road

Improving East-West Connectivity: The General Plan recommends that priority be given to improving east-west travel in the development of "an interconnected transportation system that provides choices in the modes and routes of travel." Most of the 16 corridors in the MCDOT study are north-south routes. While that is the predominant pattern of travel, creating a BRT network that allows transit riders to get between any two points with few seat changes and with reliable service is a prerequisite for being perceived by the public as a coherent system rather than a group of bus routes.

We recommend that three corridors, in addition to those recommended to be pursued in conjunction with the White Oak Science Gateway Master Plan, be studied in the next phase in an effort to create that system:

- A connection between Rockville and the Georgia Avenue interchange for the ICC, by way of MD 28/Norbeck Road
- A connection between NIH and Wheaton, by way of the following roads: Cedar Lane, Summit Avenue, Knowles Avenue, Connecticut Avenue, and University Boulevard
- A connection between Aspen Hill and White Flint, by way of Parklawn Drive and Montrose Parkway

Rapid Transit Task Force: On December 5, 2011, the County Executive forwarded the task force's recommendations for an expanded network of BRT corridors beyond what was proposed by the MCDOT study. The corridors that would be added beyond what has been identified above, and which we recommend be added to our scope of work, are as follows:

- An extension of Old Georgetown Road from Tuckerman Lane north to White Flint
- An extension of Wisconsin Avenue (MD355) south from the Bethesda Metrorail Station to the District of Columbia Line
- An extension of MD355 from the terminus of the CCT in Clarksburg to the Frederick County Line
- An extension of US29 from the Burtonsville park-and-ride to the Howard County Line
- Cherry Hill Road from US29 to the Prince George's County Line
- Georgia Avenue from the Silver Spring Transit Center to the District of Columbia Line (*This segment was the subject of a November 16, 2011 letter from Councilmembers Nancy Floreen and Hans Riemer to County Executive Isiah Leggett and to Mayor Vincent Gray requesting consideration of a change in the terminus of the proposed Georgia Avenue streetcar from Takoma Park to Silver Spring.*)
- A corridor from the Montgomery Mall Transit center to the American Legion Bridge via I-270 and I-495 (*The Master Plan calls for HOV lanes along these roads that could be used to accommodate BRT.*)

The total length of the network recommended to be evaluated in the next phase is approximately 139 miles, a reduction from the current 150 miles. It is likely that some of these corridors would merit only operational improvements and would not be included in the Functional Plan. Therefore, the corridor length of the final network is likely to be less than 139 miles. The additional corridors, however, will require more work to bring them to an equivalent level of development as with the original corridors.

It is our understanding that the Executive will be submitting a request to the County Council for additional funds to add the corridors recommended by the task force to our Functional Plan work. We will work with the Executive to include the Board's recommendations in that request. In addition, the Board would need to work with the Council to extend our schedule to provide additional time to bring these corridors up to the same level of development as the corridors now being considered.

Recommendation #3: This Functional Plan will include recommendations only for those transit corridors where dedicated transitways and intersection improvements are warranted and can be achieved, as well as those with enhanced stations that require additional right-of-way. Corridors where only operational improvements are needed (no additional right-of-way and no change in the number of travel lanes) will not be included.

Only those corridors requiring a change to the Master Plan right-of-way or number of lanes would be included in this Functional Plan. This would not prohibit or restrict transit improvements on other corridors, but we will encumber in the Master Plan only those adjacent properties where we can demonstrate the need to do so for the greater public benefit.

Recommendation #4: Within the limits of the Cities of Gaithersburg and Rockville, we are retaining BRT corridor segments for further study to the same level of detail as the rest of the proposed network. Should they desire changes in the network, the Cities should communicate their request to the County Council for consideration in conjunction with your review of this report.

Proposed Methodology

Recommendation #5: The methodology shown in Chapter 4 of the Network and Methodology report should be used to determine the preferred treatment, and the right-of-way for that treatment, for the final transit corridor network to be included in the Functional Plan.

Recommendation #6: A tiered approach will be used to identify the level of investment appropriate for each corridor, based on its ridership forecasts. This approach is illustrated on page 23 of the report.

Ridership forecasts from the MCDOT BRT Study and an analysis of corridor typologies highlight the need to differentiate the level of investment in the corridors retained for further evaluation. Some corridors merit exclusive treatments throughout the day and in both directions. Other corridors merit exclusive lanes only during peak periods in the peak directions. Still other corridors only merit queue jumpers or transit signal priority. We therefore recommend using a tiered approach that matches each corridor with a level of investment appropriate for the volume of users and travel patterns. The three tiers are defined by 2040 peak hour passenger volumes.

Tier 1: Exclusive Transitway Treatments

Corridor segments with peak hour passenger volumes in 2040 exceeding 800 in urban areas and 1,200 in suburban areas would be evaluated for exclusive transitway treatments, which could include one or two exclusive lanes, either in the median or adjacent to the curb.

For corridor segments that fall within this tier, the Functional Plan could recommend:

- Modifications to the number of general purpose lanes and bus lanes
- Additional right-of-way requirements for exclusive transit lanes, some intersections, and stations.

Tier 2: Bus Priority with Spot Right-of-Way Requirements

Corridors segments with peak hour passenger volumes in 2040 between 500 and 800 in urban areas and 700 and 1,200 in suburban areas would operate in mixed traffic and would be evaluated for bus priority, including queue jumps and transit signal priority. They do not have sufficient passenger volumes to merit an exclusive transitway treatment. Therefore, changes to the master plan could include additional right-of-way at some intersections for queue jumpers and stations.

Tier 3: Bus Priority

Corridors segments with peak hour passenger volumes in 2040 less than 500 in urban areas and 700 in suburban areas would operate in mixed traffic and would be evaluated for bus priority, including transit signal priority. Changes to the master plan could include additional right-of-way at stations.

The following table summarizes the potential master plan recommendations for each corridor segment tier based on their peak hour passenger volumes.

Tier	Peak Hour Passenger Volumes by Segment		Modifications to # of Lanes		Additional Right-of-Way		
	Urban	Suburban	General Purpose Lanes	Bus Only Lanes	Exclusive Transitways	Some Intersections	Stations
Tier 1: Exclusive Transitway Treatments	800+	1,200+	X	X	X	X	X
Tier 2: Bus Priority with Spot ROW Requirements	500-800	700-1,200				X	X
Tier 3: Bus Priority	<500	<700					X

This Functional Plan will identify and protect the rights-of-way needed to accommodate the most appropriate treatment, based on current analysis, but not prescribe that treatment. For example, a median transitway may appear to be the most appropriate treatment to accommodate dedicated bus lanes in a specific corridor. We will therefore recommend the greater right-of-way associated with that treatment, but during the implementation phase, curb lanes may prove to be more feasible or desirable in urban areas. This Functional Plan is intended to provide flexibility in the choice of treatment at the time of implementation.

Recommendation #7: The conversion of an existing travel lane to a bus lane is preferred to constructing an additional lane for corridors where passenger volumes exceed single lane person-throughput in automobiles, as long as the volume-to-capacity ratio on the remaining travel lanes is less than 1.0 under 2040 conditions.

Before recommending that additional right-of-way be protected to accommodate a transit corridor, we will first consider whether existing travel lanes can be designated as bus-only lanes. This repurposing would occur if the remaining lanes have the capacity to handle the 2040 traffic forecasts. This is a conservative approach that is not likely to result in many repurposed lanes. However, since the State is developing a person-throughput policy that will specify when a lane repurposing can occur, and since the majority of roads considered as BRT corridors are State roads, this appears to be the most appropriate approach.

We believe a progressive person-throughput approach should be considered by the State, since looking first to maximize use of existing transportation facilities before expanding them is more fiscally prudent, limits impacts to adjacent property, and supports the County's goal to increase transit usage as part of a long-term solution to our transportation needs. These corridors would also be able to be implemented more quickly. However, if repurposing is recommended when the remaining lanes do not have the capacity to handle the 2040 traffic forecasts, some drivers may decide to use transit, but may cut through neighborhoods. More detailed analysis would need to be done to determine these potential impacts.

Recommendation #8: The corridor typology will be used to determine the number of exclusive lanes for each corridor, rather than assuming that a two-lane transitway is appropriate for all corridors. Activity Center Connector corridors would be evaluated for two-way busways and Commuter/Express corridors would be evaluated for one-way busways.

The Network and Methodology Report describes these corridor typologies:

- Activity Center Connector corridors are characterized by high ridership distributed among multiple activity centers located throughout corridor, are typically implemented along major highways, or major or minor arterials, and have a moderate to high percentage of the corridor meeting BRT-supportive population or employment densities.
- Commuter/Express corridors are characterized by high ridership directed toward a CBD or transfer to regional transit services, are typically implemented along freeways, highways, or arterials, and have a low to moderate percentage of the corridor meeting BRT-supportive population or employment densities. In addition, they have a higher average ratio of peak hour travel to daily ridership than do Activity Center Connector corridors.

Since Activity Center Connector corridors are characterized by travel in both directions throughout the day, they would be evaluated for two-way busways. Since Commuter corridors are characterized by high traffic volumes in the peak direction, they would be evaluated for one-way busways; travel in the off-peak direction does not merit an exclusive lane, since it is typically uncongested.

Additional Analysis

Recommendation #9: Additional funds and resources should be allocated to provide greater certainty about potential BRT ridership and a better understanding of the traffic impacts associated with BRT implementation.

Outlined below are a number of potential additions to our approved scope of work that would provide a higher level of confidence in the ridership forecasts that were performed for the MCDOT feasibility

study, or provide information concerning the potential traffic impacts caused by the implementation of a BRT network. All of these items would require additional time and would require additional personnel and consultant resources to complete this Functional Plan. If the Board concurs that this additional work is needed, we will prepare a cost estimate and work with the Executive to include this in his additional funding request to the Council, as well as creating a revised schedule for the Board's discussion with the Council.

Additional travel demand forecasting is needed to add more specific technical detail to the model effort conducted for the MCDOT feasibility study and improve our findings.

This work effort is being conducted based on analysis performed as part of the MCDOT feasibility study. While we believe we have enough information from the feasibility study to warrant preserving additional right-of-way, our current scope does not include refining the ridership forecasts in line with the revised network nor the specific treatment that will be recommended in the next phase of our work. In addition, it appears that some adjustment to the assumptions for local bus service following BRT implementation is needed and could increase BRT ridership forecasts, potentially justifying a higher level of treatment. Findings would be improved by adding more specific technical detail to the demand forecasting model effort conducted for the MCDOT study. This additional effort would include the following:

- Updating the model to reflect local bus network improvements underway for the Corridor Cities Transitway project
- Reflecting refined station location edits as identified by M-NCPPC staff
- Updating land use assumptions to reflect ongoing master planning efforts
- Updating assumptions for modal decision-making based on a finalized list of expected design treatments
- Updating assumptions based on the anticipated level of local bus service after implementation of the BRT network
- Updating MARC future ridership based on MTA's proposed facility improvements and the planned White Flint MARC station (see discussion below)

Additional technical analysis would also contribute to policy discussions associated with this Functional Plan.

That analysis includes the following:

- Conducting analysis to determine impacts of a lane repurposing policy on the larger transportation network
- Understanding the mode choice implications of a lane repurposing policy to estimate how many people would be expected to shift to transit if roadway conditions were to become more congested
- Conducting forecasting on additional corridors identified by the Rapid Transit Task Force for an expanded network and by Planning Board to improve east-west travel options
- Developing a final network, which incorporates all final policy recommendations to determine new ridership estimates for the transit corridor network

MARC

Recommendation #10: As part of a broader response to the question of what modifications should be made to the County's transit network, we recommend that you consider adding an evaluation of the Maryland Transit Administration's MARC Growth and Investment Plan's recommendation for a third track along the CSX line between Kensington and the Montgomery County/Frederick County line to our work program as a separate master plan amendment.

In 2007, the Maryland Transit Administration created a Growth and Investment Plan (GIP) that includes staged investments through 2035 to provide faster and more reliable service on the MARC system, providing a better transportation choice for commuters and regional travelers. In addition to addressing equipment and storage needs, the plan identifies where additional tracks are needed. On the Brunswick Line, the GIP includes a third track from Kensington to Point of Rocks. Point of Rocks is the first station north of the Frederick County line and the junction for MARC service from Washington, DC to the City of Frederick via Montgomery County, which started in 2001.

The addition of a third track would provide CSX more flexibility in scheduling freight trains and therefore would create the opportunity to provide more passenger service, as has been done with the Virginia Railway Express (VRE) trains in Northern Virginia on the CSX tracks. By contrast, on December 1, 2011, MTA announced a revised schedule that reduces MARC service at several stations in Montgomery County: Kensington will lose one inbound and one outbound stop; Garrett Park will lose two outbound stops; Metropolitan Grove will lose two inbound stops and one outbound stop; and Barnesville will lose one inbound stop. These changes are being made to avoid scheduling problems with freight trains, problems that could be avoided or reduced by the addition of a third track.

Better MARC service on the Brunswick Line would not provide the same function as the entire BRT system, but MARC could become a more significant part of the solution to our transportation challenge - the GIP's 2035 projected ridership figures are almost quadruple current ridership. We recommend that the Board consider adding a study of the right-of-way needs for the MARC expansion to our work program as a separate master plan amendment, subject to approval by the County Council.

The third track is not yet in the region's Constrained Long Range Plan (CLRP). However, for the purposes of this Functional Plan, we recommend adding a scenario in our forecasting that includes implementation of MTA's plan for a third track, as well as include the planned White Flint MARC Station to determine the benefits of an integrated transit system.

Conclusion

In the preparation of this report, we have addressed what we believe to be the County's broader goal of increasing transit ridership as an important travel option. We have recommended both a network of transit corridors and a methodology for determining ridership-supported treatments for those corridors. Rather than assuming that all desirable BRT attributes are the appropriate solution for each corridor, we recommend that these treatments be individually tailored according to what the transit ridership would warrant, what the resulting traffic impacts would be, and what major obstacles are identified to

acquiring needed right-of-way. The details of those treatments will be determined in our next phase of work.

The resulting network to be included in the Countywide Transit Corridors Functional Master Plan will likely include fewer corridors once the evaluation is complete. Only those corridors needing additional right-of-way or changed number of lanes will need to be adopted as part of the plan. This Functional Plan will provide flexibility for the County to determine the most desirable treatment at the time of implementation within the corridors we recommend, and will not restrict improvements to corridors that are not in the Plan.

We are recommending further modeling and analysis to refine our ridership forecasts for the revised transit network, to reflect likely changes in local bus service after BRT implementation, to determine the effects of MTA's proposed investment in MARC's Brunswick Line, and to determine what the impacts on the transportation network would be if travel lanes are repurposed as bus lanes.

We ask that the Planning Board forward these recommendations, with any revisions they recommend, to the County Council for approval, and that you work with the Council and the Executive on appropriate funding and schedule changes necessary to complete the Countywide Transit Corridors Functional Master Plan.

Countywide Transit Corridors Functional Master Plan

Network and Methodology Report

**Maryland-National Capital Park and Planning
Commission**



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Appendix C—Recommended additions to the BRT network: Letter from County Executive Isiah Leggett forwarding the Rapid Transit Task Force’s recommendations to Montgomery County Planning Board
Appendix D—Detailed description of initial corridor and station analyses

Appendix E— Request to modify Georgia Avenue streetcar line: Letter from Councilmembers
Nancy Floreen and Hans Riemer to County Executive Isiah Leggett and to Mayor Vincent Gray
Appendix F—Comments received at Public Meetings on BRT Network

Acronyms and abbreviations

BRT	bus rapid transit
CBD	Central Business District
CLRP	<i>Regional Constrained Long-Range Plan</i>
ECSC	East County Science Center
FDA	US Food and Drug Administration
Functional Plan	<i>Countywide Transit Corridors Functional Master Plan</i>
LRT	light rail transit
MCDOT	Montgomery County Department of Transportation
MPOH	<i>Master Plan of Highways</i>
MRO	Montgomery Regional Office
MTA	Maryland Transit Administration
MWCOG	Metropolitan Washington Council of Governments
PCN	<i>Regional Bus Study: Evaluation of the Metrobus Priority Corridor Networks</i>
RRFMP	<i>Rustic Roads Functional Master Plan</i>
RTTF	Rapid Transit Task Force
SHA	Maryland State Highway Administration
WMATA	Washington Area Metropolitan Transit Authority
WSSC	Washington Suburban Sanitary Commission

This network and methodology report provides the rationale for determining the bus rapid transit (BRT) network to be adopted into the *Countywide Transit Corridors Functional Master Plan* (Functional Plan). It also presents a decision framework by which to assess rights-of-way for each potential BRT corridor for future inclusion in the Functional Plan.

The report is arranged in three sections and includes appendices.

Section 1

Section 1 presents an overview of the need for a transit corridor network to meet the County's growing transportation needs, and sets the context for the transit corridor network relative to other planning activities within the County. It also conveys the key assumptions for and characteristics of the transit corridor network within Montgomery County that will govern the assessment of each corridor.

Section 2

Section 2 proposes modifications to the 16-corridor BRT network proposed in the August 2011 Montgomery County Department of Transportation (MCDOT) Countywide BRT study. It identifies those corridors where ridership forecasts may justify requiring additional right-of-way or repurposing existing travel lanes primarily for transit use. Additional corridors are recommended to be added to our scope of work for study in the next phase. Additionally, this section gives an overview of the decision framework for right-of-way assessment along each corridor in the modified network.

Section 3

Section 3 outlines the deliverables, the public outreach efforts, and the schedule for the Functional Plan.

Appendices

Six appendices attached to this report.

- ▶ Appendix A provides information on the language of Montgomery County's General Plan.
- ▶ Appendix B outlines planning efforts countywide that support BRT development.
- ▶ Appendix C provides a copy of the Rapid Transit Task Force's recommended additions to the BRT network
- ▶ Appendix D presents the result of technical analyses conducted to date on this project to define corridor functions and station typologies.
- ▶ Appendix E provides a copy of a letter from County Council requesting a change to the Georgia Avenue streetcar line
- ▶ Appendix F presents comments received during two public meetings held to date related to the proposed BRT network presented in the MCDOT feasibility study.



Chapter 1

Introduction

The Washington, DC region is rated the most congested in the nation by the Texas Transportation Institute with average commute times exceeding 40 minutes. Congestion is expected to continue to increase, driven by a growing population, as well as a growing economy. By 2040, the Metropolitan Washington Council of Governments (MWCOG) projects the region's population to increase by 30 percent and employment to grow by 39 percent.¹ Within Montgomery County, MWCOG projects a 22- and 42-percent growth in population and employment, respectively. Significant changes at the Walter Reed National Military Medical Center, White Flint, US Food and Drug Administration (FDA), the Life Sciences Center and other commercial and employment centers are expected to impact travel conditions for many.

Transit in the County is currently provided by the high capacity Metrorail system, local bus service, and regional services such as MARC and MTA commuter bus. While plans are underway to create two high-capacity transit corridors in the Purple Line and Corridor Cities Transitway, much of the County will still lack reliable, high-speed, high-capacity transit service that provides a reliable alternative to driving an automobile and that provides connectivity among various County activity centers.

The current local bus service provides County residents access from their neighborhoods to supporting commercial centers or feeds into regional transit services such as Metrorail and MARC commuter rail and bus. Buses operate in mixed traffic and generally have several stops for

every mile they operate. Thus, their speeds and reliability are governed by the variable conditions of the roadways on which they operate, which often adversely affect service reliability.

A transit corridor network would provide improved accessibility and mobility to serve the development envisioned by the County's adopted land use plans. Implementing this Functional Plan will help further Montgomery County's General Plan's transportation goal, which is to

Enhance mobility by providing a safe and efficient transportation system offering a wide range of alternatives that serve the environmental, economic, social, and land use needs of the County and provide a framework for development (p. 63).²

BRT service could provide improved transit service through the following enhancements:

- ▶ Implementing treatments such as exclusive transit facilities or transit signal priority to improve the vehicle's operating speeds
- ▶ Providing limited stop service to key destinations spaced a half-mile or mile apart
- ▶ Providing level boarding and off-board fare collection to reduce the time it takes passengers to enter and exit a bus

Montgomery County is largely built out, with most new growth expected to occur through redevelopment, so options for building new roads or expanding existing ones are limited. High capacity rail projects are feasible only in the most densely populated areas with major employers. Preliminary design has just begun on the Purple Line as a Light Rail Transit (LRT) project. The Locally Preferred Alternative for the Corridor Cities Transitway (rail or bus) has not yet been chosen, but a decision is expected shortly. The Secretary of MDOT recently provided an

¹ *Growth Trends to 2040: Cooperative Forecasting in the Washington Region, 2010*

² The transportation goals, objectives, and strategies from the General Plan can be found in Appendix A.

economic analysis of the two alternatives for the Corridor Cities Transitway in response to a request from County Executive Isiah Leggett. That analysis showed the BRT alternative as having a larger economic benefit than LRT.

Montgomery County is focusing future development in compact, mixed-use areas that reduce the need for driving and enhance its pedestrian, bicycle, and transit network with sustainable, cost-effective solutions.

As an example of developing policy direction, a changing focus on how to measure transportation success would be appropriate. Rather than emphasize how many cars can go through an intersection, a typical transportation system performance assessment, the County will need to focus on providing as many people as possible with reliable travel options along its transportation corridors, or perhaps provide a greater travel advantage to those who use modes of travel with a smaller carbon footprint.

There are components of BRT systems nationwide that have proved to be beneficial for transit travelers, reducing travel time and increasing service reliability. We will use that experience to evaluate the 16-corridor, 150-mile transit network (see Figure 1) proposed in the MCDOT feasibility study and to determine where additional right-of-way should be secured for future transitways and transit stations.

This report recommends removing two of those corridors from the proposed network. Other corridors have been modified, and some additional alterations and refinements are likely to be recommended before we complete our work next year. After this report is finalized, the next phase will recommend specific corridor alignments and station locations to reserve sufficient rights-of-way for implementing transit

priority facilities such as exclusive transitways, queue jump lanes, and stations.³

Context

History of the *Master Plan of Highways*

The first Master Plan of Highways (MPOH) was approved and adopted in 1931, shortly after the creation of the Maryland-National Capital Park and Planning Commission in 1927. The last comprehensive update to the MPOH was approved and adopted in 1955. It covered Montgomery County's portion of the Maryland-Washington Region District as it existed at the time, which was about one-third of the County's current area—east of Georgia Avenue, east and south of the City of Rockville, and the southeast portion of Potomac (see Figure 2).

Area Master Plans were revised in the 1970's to include the Metrorail Red Line, but the MPOH map was not revised to include transitways until 1986. Additional transitways now included in the MPOH include:

- ▶ Purple Line Transitway
- ▶ Corridor Cities Transitway
- ▶ North Bethesda Transitway, and
- ▶ Georgia Avenue Busway

Over the past 56 years, there have been updates and amendments to the MPOH through various approved and adopted functional, master and sector plans, but there has been no comprehensive update. The most significant countywide update since 1955 was the creation of the Rustic Roads Functional Master Plan (RRFMP) in 1996.

³ Queue jump lanes facilitate a BRT vehicle advancing through an intersection ahead of general-purpose traffic.

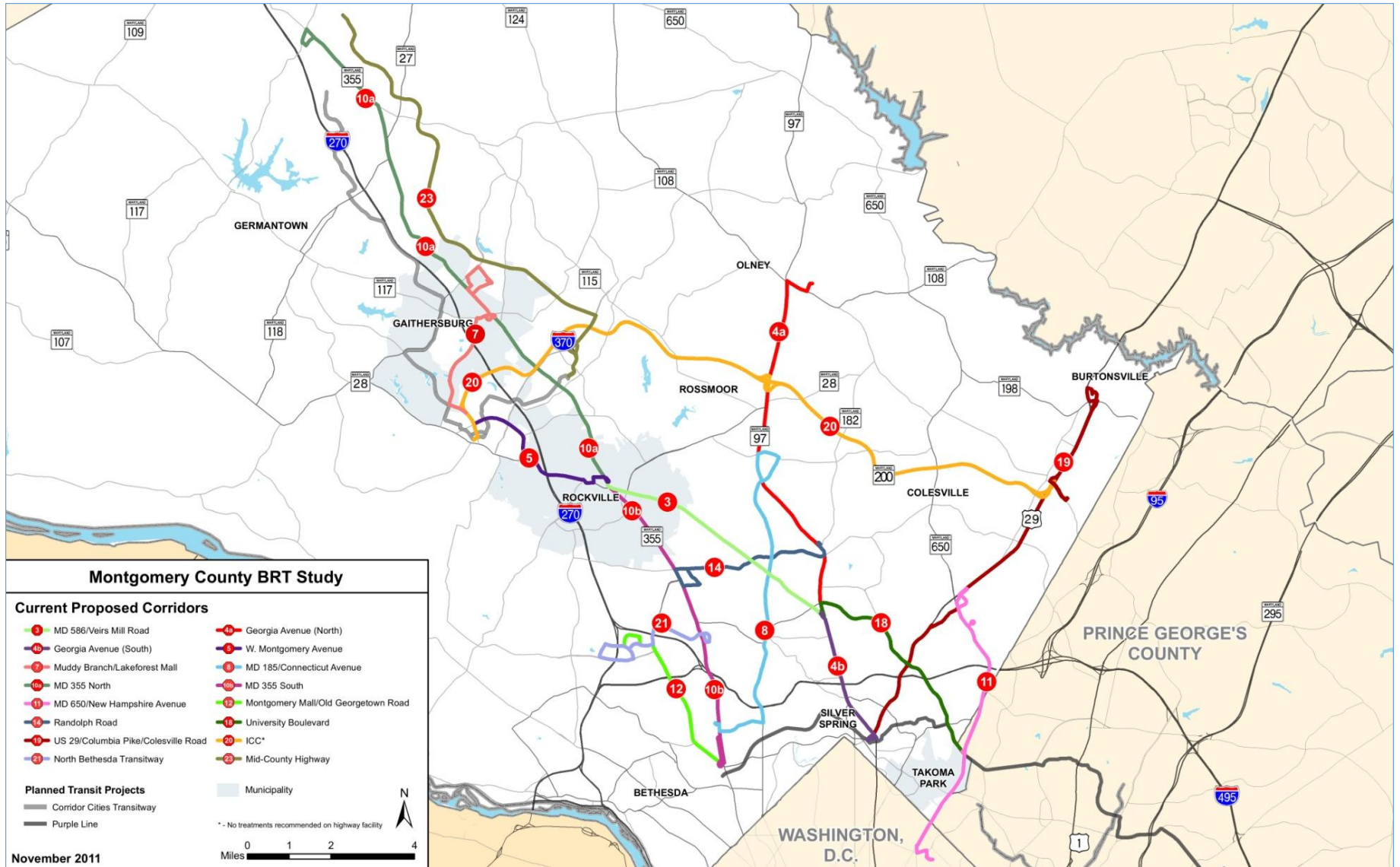


Figure 1. BRT network proposed in the MCDOT Feasibility Study

The Countywide Transit Corridors Functional Master Plan is a complementary effort to that plan. The RRFMP sought to preserve many of the roads in the rural area of the county to reflect and further the goals of the 1980 Functional Master Plan for the Preservation of Agricultural and Rural Open Space. In contrast, this Functional Master Plan reflects the growing urbanization of the I-270 corridor and the down-county area and will provide the mobility needed to accommodate that growth without adversely affecting the quality of life for those who live, work, and patronize the businesses along our major roadways.

Overview of recent and current master plan and section plans

All of the master and sector plans reviewed for the Functional Plan emphasize the importance of transit; some specifically mention a proposed BRT corridor and its potential benefits to that community. The plans and related reports reviewed for this report include the following:

- ▶ Takoma/Langley Crossroads Sector Plan
- ▶ New Hampshire Avenue Corridor Concept Plan
- ▶ Kensington Sector Plan
- ▶ Wheaton CBD and Vicinity Sector Plan
- ▶ Long Branch Sector Plan
- ▶ Comprehensive Amendment to the Bethesda/Chevy Chase Master Plan
- ▶ US 29/Cherry Hill Transit-Oriented Development Scenario Planning Report

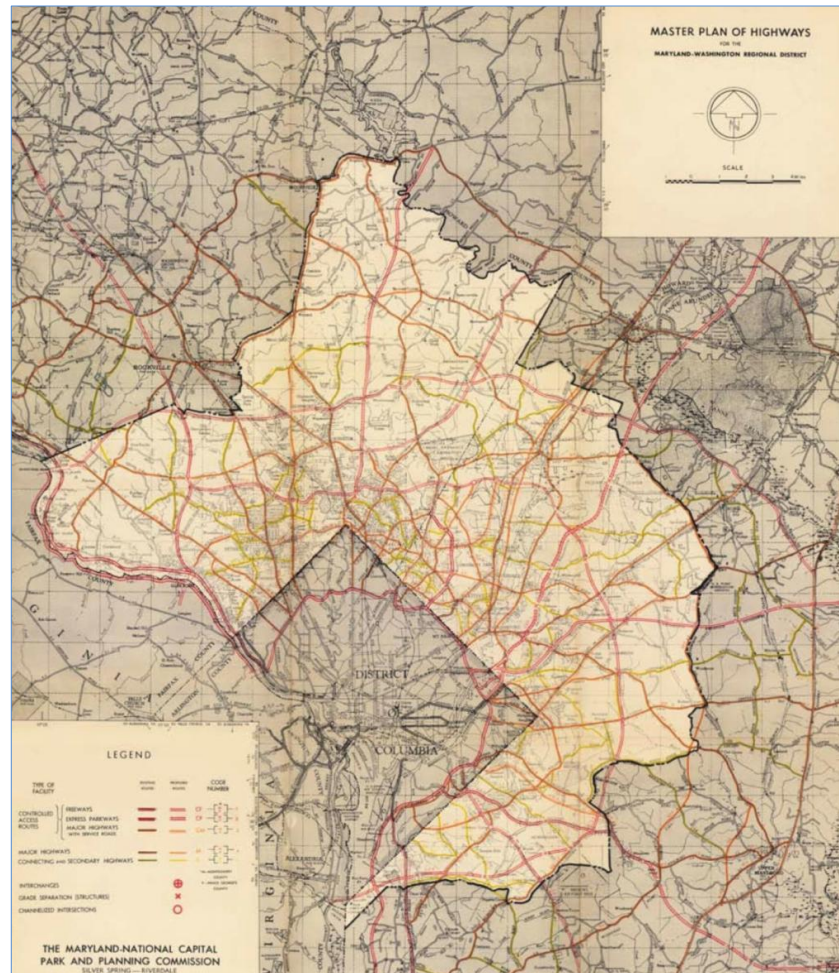


Figure 2. 1955 map of *Master Plan of Highways*

- ▶ Bus Rapid Transit Update, East County Science Center Master Plan, Citizens Advisory Committee, September 20, 2011
- ▶ Clarksburg Master Plan & Hyattstown Special Study Area
- ▶ 2002 Comprehensive Master Plan and Rockville Pike Plan 2010 (Draft)
- ▶ City of Gaithersburg 2009 Master Plan Update

Review efforts also included other related transit projects and planning efforts in the County; those documents include the following:

- ▶ Regional Constrained Long-Range Plan (CLRP)
- ▶ Wheaton Station Bus Transit & Access Needs Assessment and Montgomery County Strategic Transit Plan

A summary of these reports is located in Appendix B.

Immediate history of this master plan effort

In 2008, following approval of a network report and implementation strategy by its Board of Directors, the Washington Area Metropolitan Transit Authority (WMATA) evaluated a regional Priority Corridor Network (PCN)—consisting of systemwide corridor improvements within the Washington, DC Metropolitan area and under different investment scenarios. The system, consisting of 24 bus routes serving 100 miles, would have easy-to-understand route layouts, fewer stops, more frequent service, and a system that gives buses priority at signalized intersections. It was proposed to operate generally in mixed traffic on existing roads with traffic signal priority and queue jumpers, but it also identified a couple of corridors where exclusive bus lanes would be desirable. A comparison of the PCN and the network proposed in this report can be found in Appendix B.

In 2008, Montgomery County Councilmember Marc Elrich proposed a 120-mile BRT network. His network focused on providing commuters a faster, more convenient alternative to driving alone, as well as opportunities for improved air quality and improved quality of life for County residents. To provide a cost-effective premium transit service, Councilmember Elrich has proposed operating existing buses in reversible BRT guideways that would serve the peaked demand found along most of the County's roadways. Councilmember Elrich's system concept can be found in Figure 3.

In August 2011, the Montgomery County Department of Transportation evaluated a 16-corridor, 150-mile BRT network. The network's ridership potential was evaluated for the year 2040 based on a network that required no additional right-of-way on County and State roads. The study determined that such a network

was feasible and identified actions for enhancing the speed, reliability, rider comfort, and convenience of the BRT system.

This year, County Executive Isiah Leggett also established the Rapid Transit Task Force (RTTF) to provide advice on how to make comprehensive rapid transit in Montgomery County a reality. The Task Force's approach is to gather, analyze and discuss information on BRT; discuss viable alternatives and their sustainability; and consider specific proposals to plan, finance, construct, and operate a BRT system.

On December 5, 2011, the Executive endorsed and forwarded to the Planning Board an updated set of corridor recommendations by the RTTF (see Appendix C). Those recommendations reconfirmed the 16-corridor, 150-mile network proposed in MCDOT's feasibility study, and added several corridors.

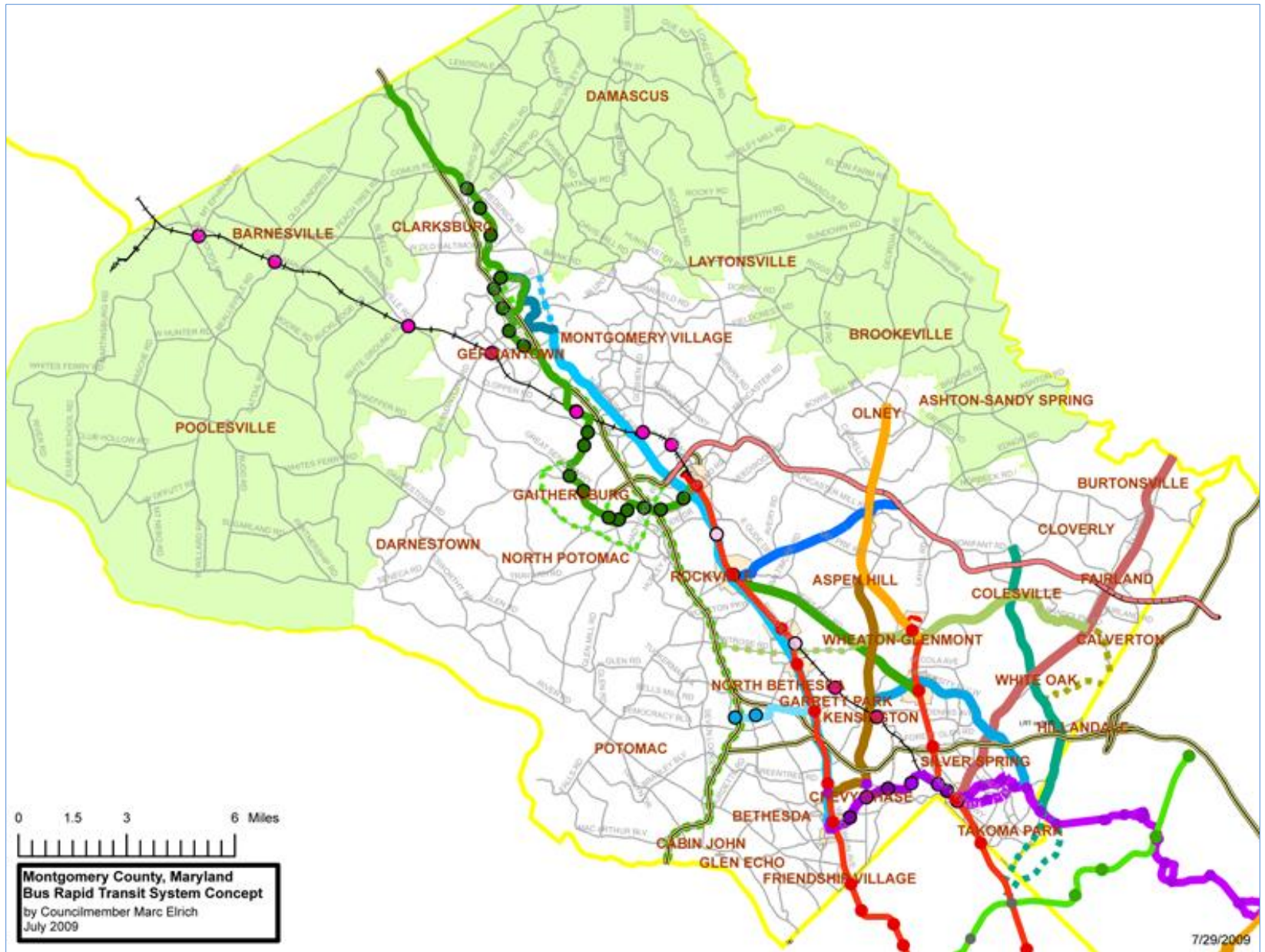


Figure 3: Councilmember Elrich's System Concept

Chapter 2

General framework

Characteristics of a transit corridor network in Montgomery County

The report refines the proposed transit corridor network to identify those corridors that could operate with the following characteristics:

- ▶ Exclusive lanes or dedicated transitways where possible
- ▶ Stops every half-mile to one mile
- ▶ Queue jump lanes where appropriate
- ▶ Enhanced stations with greater passenger amenities
- ▶ Transit signal priority where appropriate
- ▶ All-day service
- ▶ Higher service frequencies than traditional bus service (i.e., minimum of 10-minute headways during the peak period and 15-minute headways during the off-peak period)
- ▶ Real-time passenger information
- ▶ Potential for off-board fare collection
- ▶ Level boarding and alighting

The BRT system would emulate light rail operations in terms of the features provided, but would operate on the arterial roadway system in the County using the lower costs of bus technology. Instead of investing in trains and tracks, BRT invests in dedicated transitways and exclusive lanes, intersection priority treatments, and low-floor vehicles to speed up its transit service. The intent is to create a high-capacity transit system that will be appropriate for the forecasted ridership.

The following four items are the focus of this Functional Plan:

- ▶ BRT activities corridors that would benefit from exclusive two-lane runningway enhancements for all-day service
- ▶ Non-BRT express and commuter corridors that would benefit from single-lane peak-period weekday runningway improvements

- ▶ Link corridors that would benefit from runningway enhancements
- ▶ Transit station areas

Integration with the Red Line, Purple Line, and Corridor Cities Transitway

The transit corridor network needs to be coordinated with existing and planned rapid transit projects to ensure a fully integrated transit network, while not adversely affecting the ridership of these major transit facilities. Some of the major issues that need to be considered are as follows:

Red and Purple Lines

- ▶ **Bethesda Metrorail station**—coordinate on BRT station locations to facilitate transfer opportunities to both the Red and Purple Lines for Corridor 10b: MD 355 South and Corridor 12:Montgomery Mall/Old Georgetown Road
- ▶ **Silver Spring Metrorail station**—coordinate on BRT station locations within the Silver Spring Transit Center (expected completion date—April 2012) to facilitate transfer opportunities to both the Red and Purple Lines with Corridor 4b: Georgia Avenue South and Corridor 19: US 29
- ▶ **Takoma/Langley Park Transit Center**—coordinate with MTA on the potential for shared station opportunities with the Purple Line for Corridor 11: MD 650/New Hampshire Avenue, and Corridor 18: MD 193/University Boulevard
- ▶ **University Boulevard**—Both the Purple Line and the BRT system will operate along University Boulevard between Piney Branch Road and the Takoma/Langley Park Transit Center. MTA is designed a median transitway for the Purple Line. Coordination is needed to decide whether BRT should share the median transitway with the Purple Line, operate in its own exclusive right-of-way, or operate in

mixed traffic.

- Shared operation with Purple Line—While permitting BRT to operate in the Purple Line transitway for a short segment would maximize the use of the right-of-way, it is not currently understood whether this could present operational challenges for the Purple Line and impact its ability to maintain a six-minute headway.
- Exclusive transitway for BRT—Providing an exclusive transitway for BRT would require either converting a general traffic lane to BRT use or require acquiring additional right-of-way. However, accommodating six lanes of general traffic, two lanes for the Purple Line, two lanes for BRT, and two bicycle lanes would create a wide crossing for pedestrians, in addition to requiring a much wider right-of-way.
- Operating in mixed traffic—BRT would not benefit from travel time savings. This recommendation should be developed in coordination with MTA and SHA and should evaluate the travel time reduction for Purple Line passengers compared to the travel time savings for BRT passengers.

Corridor Cities Transitway

- ▶ **Life Sciences Center**—coordinate with MTA on BRT station locations to facilitate transfer opportunities among the Corridor Cities Transitway, Corridor 5: Rockville-Life Sciences Center, Corridor 7: MD 124/Muddy Branch Road, and Corridor 20: ICC

A few of the proposed BRT corridors could negatively impact the ridership of the Corridor Cities Transitway, potentially hurting its cost-effectiveness measure in the FTA New Starts program. These include Corridor 5, Corridor 10a, and Corridor 23.

These corridors serve some or all of the same markets as the Corridor Cities Transitway. Further evaluations of ridership changes along the relevant BRT and Corridor Cities Transitway corridors would need to be assessed to understand the degree to which there could be negative impacts.

Background information

The following sections in the remainder of this chapter provide background information for the Functional Plan, but are not critical to the decisions needed to transmit this network and methodology report to County Council.

Issues Affecting Right-of-Way Decisions

The issues addressed in the remainder of this chapter have various trade-offs in regard to operation of a BRT facility. Some are operational issues that require closer coordination with agency stakeholders in the next phase of the development of this Functional Plan to determine how BRT should operate in Montgomery County. Other issues are dependent on further analysis to determine how the network and stations would best accommodate BRT trip patterns and volumes. They are presented as considerations for the work to be conducted, but no decision by the Board is required on these issues at this time.

Corridor functions⁴

The following corridor functions were defined to summarize the types of trips expected along proposed the corridors and to identify the necessary supportive facilities within those corridors.

⁴ Refer to Appendix D for additional information on assessing the function of each BRT corridor in this Functional Plan.

Activity center connector

- ▶ High ridership distributed among multiple activity centers located throughout corridor and at termini
- ▶ Typically implemented along major highways, or major or minor arterials
- ▶ Moderate to high percentage of corridor meets BRT-supportive population or employment densities

Link

- ▶ High ridership distributed between activity centers located at termini
- ▶ Typically implemented along major or minor arterials
- ▶ Moderate percentage of corridor meets BRT-supportive population or employment densities

Commuter/Express⁵

- ▶ High ridership directed toward CBD or transfer to regional transit service, typically located at terminus
- ▶ Typically implemented along freeways, highways, or arterials
- ▶ Low to moderate percentage of corridor meets BRT-supportive population or employment densities
- ▶ Much higher than average ratio of peak hour travel to daily ridership volume

The corridor function types will aid discussions of the degree of right-of-way investment needed in the County relative to ridership potential, given specific land-use types, and roadway classifications within each potential BRT corridor. The initial analysis shows that some corridor types are more conducive to the needs for additional parking; however, such considerations would be more appropriate for detailed individual development of BRT corridors in Montgomery County.

⁵ Stations along an express corridor are generally separated by several miles, as compared to a commuter corridor.

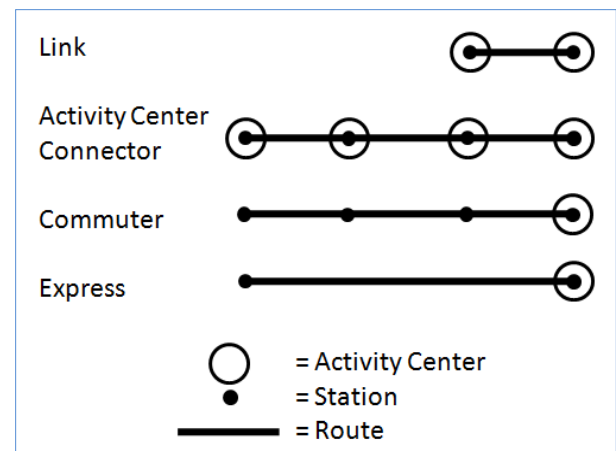


Figure 4: Representation of defined corridor functions

Existing transit service will be identified for each corridor to assist in the determination as to where dedicated bus lanes are needed and where they should be located (median or curbside). Further discussion on corridor functions is found in Appendix D.

Intersection treatments

A conceptual understanding of intersection and midblock configurations, along with the addition of BRT facilities, is key to determining the right-of-way needed along the proposed BRT corridors. The master planning effort will apply typical cross-sections to each intersection and midblock location to determine the net right-of-way impact of implementing the transit corridor network.

There are four types of typical sections considered with BRT operations, listed as follows:

- ▶ In the curb lanes
- ▶ In a single busway lane within the median area
- ▶ Within one of two different dual-lane median busway configurations
 - Open concept—allows BRT and maintenance vehicles to easily enter and exit the busway, while maintaining separation from general traffic
 - Closed concept—maintains strict separation between busway and general travel lanes

The typical sections are being developed using guidance from Montgomery County's 2009 revision of the "Road Code," which incorporates context-sensitive design options to help realize more multimodal thoroughfares within the County, as well as roadway design policies developed by Maryland State Highway Administration.

Design treatments affecting minor and midblock left-turn provisions, queue jump lanes, and similar specific implementation guidelines will be developed further during preliminary and final engineering phases for each BRT corridor.

Station types, locations, and access⁶

Station types will be assigned to each of the proposed BRT station in the network. The classification process will aid in identifying:

- ▶ The influence of land uses surrounding a station
- ▶ The means by which to access a station and the need for parking and bus transfer facilities to serve a station
- ▶ Station locations (off-street or on-street)
- ▶ The relationship of on-street stations to the median or curb and placement along the street (pending the particular BRT alignment and operation)
- ▶ The level of passenger amenities and degree of shelter needed, given the estimated ridership patterns at a station

Six typologies were defined for classifying stations within the proposed transit corridor network.

- ▶ Transit Center
- ▶ Central Business District (CBD)
- ▶ Park-n-Ride Lot
- ▶ Major Activity Center
- ▶ High-Density Residential
- ▶ Low-Density Residential

Further work will include applying the station typologies to the station locations identified in

⁶ Refer to Appendix D for further discussion of station typologies defined for this Functional Plan.

the feasibility study. The work will also assess the level of station access (by auto, bicycle, walking, or other transit modes) and specific station locations (on- or off-street; near-side, far-side, or midblock) to determine the proposed station footprint and thus necessary right-of-way for BRT stations.

Assessing right-of-way impacts

Available right-of-way

The BRT feasibility study conducted a conceptual assessment of locations where rights-of-way could be reserved for BRT busways. These were primarily within the existing right-of-way along each corridor. In contrast, this Functional Plan uses the right-of-way recommendations listed in approved and adopted master and sector plan as our baseline. We will then identify where additional rights-of way are needed for dedicated bus lanes, queue jumpers, and stations.

Additional right-of-way requirements

Using guidance from typical cross sections and station typology definitions developed for this effort, the new right-of-way needs beyond those in the approved and adopted master and sector plans will be assessed for each corridor, depending on the treatments appropriate for a particular transit corridor (to be further discussed in the Methodology section of this report). This assessment will not identify right-of-way needs at the individual parcel level, an effort that is most appropriate during detailed corridor planning.

Guided vs. unguided transitway

An important consideration in determining the overall right-of-way width for a transit corridor will be the type of busway that could be implemented: guided or unguided. Guided systems provide infrastructure (often optical or mechanical) which helps keep the transit vehicle within a specific travel space to improve system performance and provide for accurate docking at stations. Unguided transitways provide space and rely on driver training to maintain the vehicle

location along the corridor. In general, a guided busway requires less right-of-way than does an unguided busway. This is a key factor, as the Functional Plan and the initial BRT feasibility study both recognize the limited opportunities to widen roadway cross-sections within Montgomery County.

Guided transitway

There are multiple benefits to implementing a guided transitway, which is up to 12-13 feet narrower at the midblock cross-section along the length of a BRT corridor⁷ than an unguided transitway. This is beneficial in terms of savings on construction costs, needed right-of-way, and maintenance.

BRT vehicles operating within a guided environment can use mechanical (in combination with curbed concrete “rails,” shown in Figure 5), optical, or magnetic guidance to ensure they travel safely in opposing directions within closer distances of one another in dual guideways. They can thus operate at higher speeds compared to driving in either an unguided environment or a guided environment without a guiding mechanism (shown in Figure 6)⁸ where drivers naturally tend to slow down and steer away from the opposing BRT vehicles they are passing. The guiding mechanism used in a guided transitway can also greatly improve precision docking at station and thus improve level boarding onto vehicles. Additionally, there is greater opportunity to provide wider grass strip for stormwater management, as a guiding mechanism limits the driver’s tendency to sway within the transitway.

The concerns to implementing a guided transitway affect maintenance. In general,

because of the enclosed environment, it would be more difficult to serve disabled BRT vehicles at any point along the transitway. Additionally, other approaching vehicles would find it difficult or impossible to bypass a disabled BRT vehicle. In terms of snow removal, maintenance vehicles would find it challenging to plow transitways—particularly to remove snow without pushing the snow onto another transit lane (in the case of dual-lane transitways) or general traffic, or potentially damaging raised curbs hidden beneath the snow.

Unguided transitway

There are also various benefits to implementing an unguided transitway. Maintenance vehicles could service disabled vehicles much more easily and approaching BRT vehicles would find it easier to bypass disabled vehicles. Snow removal would be less challenging, as the physical separation between the transitway and general traffic lane would not exist. BRT vehicles could also operate at higher speeds without the need for any guiding mechanism.

The concerns to implementing an unguided transitway concern right-of-way requirements, precision docking, and stormwater impacts. Because of its generally higher right-of-way needs, an unguided transitway would likely result in increased construction and maintenance costs. Without a guiding mechanism, precision docking would be limited for BRT vehicles operating in an unguided transitway. Lastly, because drivers would tend to sway while operating within an unguided transitway, there would be less width available for a grass strip for stormwater management.

In general, a guided transitway would be the preferred operating environment because it requires less right-of-way than does an unguided transitway. Table 1 summarizes the attributes of guided and unguided transitways.

⁷ At intersections where there are breaks in a continuous transitway, BRT vehicles may travel at reduced speeds to allow proper re-entry into a guided environment.

⁸ A transit operator may choose to operate vehicles without a guidance mechanism for a number of reasons, a couple of which include initiating guideway operations while finalizing the guidance technology and remaining flexible in the types of transit modes allowed to use the guideway.



Figure 5. Guided transitway using mechanical guidance (Leeds, UK)



Figure 6. Guided transitway without vehicle guidance (Eugene, OR)

Table 1. Attributes of Guided vs. Unguided Busways

Attributes	Guided Transitway	Unguided Transitway
Right-of-way requirements	<ul style="list-style-type: none"> • 15 feet (one-way reversible busway) • 24-25 feet (dual-lane busway) 	<ul style="list-style-type: none"> • 25 feet (one-way reversible busway) • 24-30 feet (dual-lane open concept busway) • 36 feet (dual-lane closed concept busway)
Pavement cost	<ul style="list-style-type: none"> • Reduced pavement construction cost • Less pavement maintenance cost 	<ul style="list-style-type: none"> • Greater pavement construction cost • Greater pavement maintenance cost
Precision docking	<ul style="list-style-type: none"> • Significantly improved at stations/level boarding, with reduced dwell time (based on use of guiding mechanism) 	<ul style="list-style-type: none"> • Limited without use of guiding mechanism
Speed characteristics	<ul style="list-style-type: none"> • Higher speed with formal guiding mechanism (ex., Leeds, UK) • Slower speed with no formal guiding mechanism (ex, Eugene, OR) 	<ul style="list-style-type: none"> • Higher speed without needing guiding mechanism (due to less constrained transitway)
General maintenance/hazard removal	<ul style="list-style-type: none"> • More difficult to serve disabled vehicle • More difficult or impossible for vehicle to get around obstacle in busway • Snow removal more difficult 	<ul style="list-style-type: none"> • Easier to serve disabled vehicle • Easier for vehicle to get around vehicle in busway • Snow removal could be easier
Stormwater impacts	<ul style="list-style-type: none"> • Ability to provide grass strip for stormwater management 	<ul style="list-style-type: none"> • Limited filtration area for stormwater management

Comparison of median transitway and

curbside lane treatments⁹

⁹ This comparison was motivated in part by a need to reach consensus on a transitway treatment along Rockville Pike, but is also useful for all routes being evaluated. The City of

There are two types of transitway treatments that are intended solely for transit vehicles: median transitways, which operate in the middle of the roadway, and curbside lanes, which operate on the right side of the roadway, against the curb.¹⁰

Each type of facility treatment will be discussed in the sections that follow.

Median transitway

Median transitways are preferable to curbside treatments because they provide the highest BRT speeds and capacity with the least conflict with other motor vehicles and bicycles. This is because other vehicles are only permitted to cross the transitway at signalized intersection. Special consideration must therefore be given to accommodating left turns, facilitating pedestrian crossings, and restricting local access.

Facilitating pedestrian crossings

With a median transitway, all transit riders would cross some portion of the street to access a station. In addition to providing an adequate area for patrons to wait for the transit vehicle, an adequate pedestrian waiting area is also needed at the end of the platforms to accommodate transit riders waiting for a pedestrian signal to cross the street.

Restricted local access

A major impact of median transitways is the restriction of local access at unsignalized intersections and driveways. The median transitway acts as a raised median, and it would require restricting vehicles wanting to make left turns into and out of local driveways and intersections. Vehicles should not cross a transitway facility at-grade except at signalized intersections, as it would be difficult for drivers to

see and properly interpret bus movements along the transitway.

Accommodating left turns

Left turn lanes would be provided at signalized intersections to the right of the transitway under protective signal control to reduce potential conflicts with transit vehicles traveling through the intersection. Due to the reduced access at driveways and unsignalized intersections, many signalized intersections would need to accommodate u-turns, increasing demand for left-turn storage. In addition, many now unsignalized intersections may need to be signalized to both accommodate these movements and avoid overloading currently signalized intersections. Additional right-of-way may be needed at these minor intersections to accommodate additional turn bays.

Curbside lanes

Curbside lanes are not preferred for BRT because they reduce BRT operating speeds and increase opportunities for conflicts with other motor vehicles. This is because other vehicles are allowed to enter the transitway to make right turns and because they are available for use by local transit vehicles that make more frequent and longer stops. Curbside lanes are located to the right of general travel lanes and to left of a parking lane, if they are maintained along BRT corridors. Other considerations with curbside lanes are:

- ▶ **Enforcement**—Curbside lanes are more difficult to enforce (i.e., it is hard to know whether a general traffic vehicle is using the lane for local access, making a turn, or violating the lane access)
- ▶ **On-street parking**—Parking maneuvers temporarily block the lane. These factors reduce BRT operating speeds and increase opportunities for conflicts with other motor vehicles.

Rockville envisions the roadway as being reconfigured as a six-lane boulevard, with premium transit operating in the adjacent service lanes or median lanes with a decision still to be made.

¹⁰ Side-of-road transitways (both bus lanes on one side of the roadway) are not being assessed in this effort (other than for the master-planned North Bethesda Transitway) due to local access impacts.

- ▶ **Improving other transit service**—Curbside lanes could be made available for use by buses other than BRT, increasing the latter’s operating speed and perhaps offsetting the reduction in BRT operating speeds. Having numerous transit routes present within a curbside lane could provide the passive enforcement needed to deter lane violators and thus increase operating speeds (and perhaps offsetting the reduction in BRT operating speeds).

Given these insights—as well as (1) the high traffic volume found along many of the major and minor arterials within the County, and (2) the opportunity to integrate a bus bypass lane—a median transitway treatment would be the preferred treatment option for those corridors that can support frequent BRT service. It would provide for both the highest BRT speeds and overall capacity for the corridor and the least conflict with other motor vehicles and bicycles.

Contra-flow BRT operation

While it may be tempting to consider using an off-peak travel lane for a peak direction BRT busway, this is not a recommended solution where the travel lanes are separated by a raised median. There is an increased potential for motor vehicle/bus and pedestrian/bus collisions because the buses would travel in the opposite direction of “expected” travel, and the raised median only heightens the expectation of same-direction travel. There is also an increased potential for collisions to occur at intersections when vehicles cross a contra-flow lane to make a left turn.

Past applications have inserted flexible bollards into the pavement to provide separation between the travel lanes and the contra-flow lane and reduce the potential for conflict in a contra-flow situation. However, this raises other difficulties. Midblock left turns would be prohibited, and there are added operations costs (and potential safety issues) associated with maintenance crews

having to go out and move the physical separation devices placed to provide clearer separation of the contra-flow lane operation. In addition, it is still possible to have collisions amongst all movements during the transition period when the direction of the contra-flow lane operation changes from one direction of the street to the other.

Finally, contra-flow operations require increased use of overhead lane-use control structures and signage and signals or “blank-out” signs so that drivers have adequate information about lane usage. This can create added capital costs, as the location of the contra-flow lane in the middle of the roadway will require a support mechanism for such an overhead information system, at a minimum a span wire (such as on MD 97 and US 29) or sign bridge. This would also degrade the visual aesthetics of a corridor.

Reversible lane BRT operation

Reversible lanes for use by general traffic already exist on segments of the Georgia Avenue and Colesville Road corridors. Because no medians exist in these segments, the potential problems identified above for contra-flow operation are not applicable. A peak-flow direction lane in these segments could be repurposed, either in the leftmost lane for BRT use only or in the curbside lane for use by all buses. The decision on which travel lane to repurpose will need to be considered along with the placement BRT stations to ensure safe pedestrian access and effective BRT operations.

Chapter 3

Draft network and potential changes

Initial analyses¹¹ of MCDOT’s proposed 16-corridor BRT network led to the proposed removal of two BRT corridors for right of way

¹¹ Refer to Appendix D of this report for discussions of the initial analyses that have been conducted on the proposed BRT corridors.

assessments as well as realignments to additional corridors. The following sections identify the affected corridors and outline the reasons for these potential changes, and discuss options for addressing corridors in the Cities of Rockville and Gaithersburg.

Corridor removals

The characteristics of two corridors provide insufficient justification for allocating right-of-way to provide high-quality premium transit service. These corridors are recommended to be removed from further consideration for the following reasons:

- ▶ **Corridor 20: ICC**—at 22.9 miles in length with an average station spacing of 11.5 miles, this corridor would function as express service rather than BRT service. Additionally, bus service would operate along a tolled, high-capacity facility whose toll rates are intended to keep the facility congestion-free, negating the need for dedicated bus lanes. The Maryland Transit Administration already operates two commuter express bus routes along the ICC and will expand this service to five routes in January 2012.

Key network policy issues

The 150-mile network studied by MCDOT and expanded to 164 miles by the additional corridors recommended by the County Executive and Rapid Transit Task Force (RTTF) is quite large. If built completely as two-way dedicated median transitways for BRT, it would be the world's largest such system. If this is done without repurposing any existing travel lanes, or without a mix of transitway treatments including some segments with mixed-traffic operation, it would require significant additional right-of-way along these corridors.

More work still needs to be done in the next phase of work to determine which corridor segments would warrant dual lane treatment. However, it seems clear that the 2040 ridership forecasts conducted as part of the MCDOT feasibility study for most of the corridors being considered do not meet industry standards for bi-directional, 14-hour BRT service. Building dual lanes only where merited by ridership forecasts would avoid unnecessary right-of-way impacts and capital costs.

It is recommended that a Countywide Transit Corridors Functional Master Plan effort be pursued to address the County's goal of improving transit alternatives across a wide spectrum of services—such as median transitways, dedicated curb bus lanes on both sides of the road, single lanes for peak-hour use, and queue jumpers to get buses out ahead of mixed traffic at intersections. Provisions for these corridors would be recommended where service would require additional rights-of-way or would affect the number of Master Plan travel lanes. This approach to the Functional Plan would provide a broader transit improvement than designating transit corridors only where BRT ridership forecasts would merit bi-directional, 14-hour service.

Issues for the Board to consider are as follows:

- ▶ Deciding whether a bi-directional BRT system is appropriate in all corridors, given their right-of-way constraints as well as the trip patterns and volumes present on these corridors
- ▶ Deciding whether this Functional Plan effort should make recommendations for all evaluated transit corridors where improvements are needed or only for those where dedicated transitways and intersection improvements are warranted and can be achieved
- ▶ Choosing to pursue the General Plan goal of improving east-west transportation as part of this effort and considering additional corridors toward that end
- ▶ Adding corridor segments along New Hampshire Avenue and Randolph Road to support additional development now being considered as part of the White Oak Science Gateway Master Plan
- ▶ Adding corridor segments as recommended by the County Executive and the Rapid Transit Task Force
- ▶ Deciding whether this Functional Plan should recommend the specific exclusive transit facility treatment (i.e., single or dual lanes, median or curb lanes) or leave such decisions to the Executive Branch at the time of implementation

- ▶ **Corridor 23: Midcounty Highway**—this 13.4-mile-long corridor would provide upcounty residents with access to the Red Line Metrorail line and destinations it serves, but appears to compete with both the Corridor Cities Transitway and Corridor 10b/MD355 North. This Functional Plan would recommend that most of this corridor be removed from the network to avoid this conflict. In the next phase though, it is recommended that the segment of Corridor 23 along Snowden Farm Parkway north of Ridge Road be combined with the segment of Corridor 10a: MD 355 North that is south of Ridge Road to create a single transit corridor east of I-270. This corridor would provide service to Clarksburg Town Center while avoiding impacts to the Clarksburg Historic District along MD355.

Additional corridors may also be removed in the final Functional Plan because their ridership would indicate that lesser transit treatments would be warranted, rather than requiring additional right-of-way for dedicated lanes or queue jumpers. Recommendations on these justifications will be made during our next phase of work.

BRT corridors within the cities of Gaithersburg and Rockville

Several of the potential BRT corridors being evaluated are located at least partially within the boundaries of Gaithersburg and Rockville, which are municipalities that have their own planning authority. Gaithersburg recently updated its master plan with recommendations to increase transit use and language that is supportive of BRT. Rockville is updating its master plan and specifically supports BRT along MD355. The corridor segments within these municipalities are as follows:

Gaithersburg

- ▶ **Corridor 7: MD 124/Muddy Branch Road (between Life Sciences Center and Lakeforest Mall)**—Segment north of Sam Eig Highway
- ▶ **Route 10a: MD 355 North**—Segment from Game Preserve Road to Shady Grove Road

Rockville

- ▶ **Route 3: MD 586/Veirs Mill Road**—Segment from Rockville Metrorail Station to Twinbrook Parkway
- ▶ **Corridor 5: Rockville Metrorail Station -Life Sciences Center**—Segment east of Shady Grove Road
- ▶ **Route 10a: MD 355 North**—Segment from 600 feet north of Ridgemont Avenue to Church Street/Rockville Metrorail station
- ▶ **Route 10b: MD 355 South**—Segment from Church Street/Rockville Metrorail station to Bou Avenue

Because these corridor segments are outside the jurisdiction of the Functional Plan, the Plan’s final recommendations in these municipalities will not carry the same weight, and therefore a decision needs to be made as to the level of detail that should be pursued in these areas. This is particularly true for more urbanized corridor segments and station areas that will require more attention than the norm because of limited right-of-way. In addition, this Plan has a timeframe that is likely much shorter than the Cities would desire for coordination with their mayors, Councils, and citizens.

One alternative would be to forego detailed recommendations in these municipalities, retaining the routes we believe are viable but not making specific recommendations as to right-of-way. M-NCPPC would continue to coordinate with the Cities’ staff and provide them with any information and methodology developed for the Functional Plan, which they could use in their more detailed planning. In discussions with the Cities’ staffs, however, they indicated they would

appreciate more detailed guidance in the Functional Plan as to how the network should be accommodated in their jurisdictions.

It is recommended, therefore, that these corridor segments be retained for continued study, and that they be developed to the same level of detail as the rest of the network. If the Cities would like any corridor changes to be evaluated, they should transmit those comments to the County Council.

Guidance on any desired changes is needed from the Cities following the Board's review of this report for two reasons:

- ▶ The County Council should have this information available so that they can consider any potential expansion in our scope of work, including the additional corridors recommended by the Rapid Transit Task Force as forwarded by the County Executive. As noted above, the timeframe is quite short for this Functional Plan effort and tasks will quickly need to be initiated once the Council has finished their review and given its direction on any changes to the Functional Plan's scope of work.

Corridor realignments

The proposed realignments are intended to provide more efficient BRT service along certain corridors and improve connectivity to other transit modes or intermodal opportunities. The following changes are proposed and summarized in Table 2.

Table 2: Proposed Network Changes

Corridor 4a: Georgia Avenue North

Route northern end of corridor to directly access planned transit center at Montgomery General Hospital

Corridor 4b: Georgia Avenue South

Explore alternative alignment for southern segment terminating in Silver Spring, by way of Colesville Road (adjacent to Silver Spring Transit Center) to Georgia Avenue

Corridor 10a: MD 355 North

Explore alternative alignment for northern segment terminating in Clarksburg, by way of M83 to Ridge Road, and then to MD 355 (former northern section of Corridor 23: Midcounty Highway)

Corridor 14: Randolph Road

Realign corridor's western end to terminate at White Flint Metrorail station by way of Parklawn Drive and Nicholson Lane, instead of Nebel Street and Marinelli Road, in order to serve the planned White Flint MARC station at Nicholson Court

Corridor 18: MD 193/University Boulevard

Realign corridor's western end to terminate at Wheaton Metrorail station by way of University Boulevard to Veirs Mill Road

Corridor 19: US 29

Explore alternative alignment to bypass Paint Branch section of US 29 by way of Old Columbia Pike Bridge over Paint Branch

Figure 7 shows the proposed network modifications for this Functional Plan.

Additional Corridors

The General Plan recommends improving east-west connectivity; therefore, the Functional Plan recommends three additional corridors be assessed for viability as part of the BRT network. In addition, two corridors—Randolph Road east of Georgia Avenue and New Hampshire Avenue north of US 29—were evaluated during the preliminary phase of the feasibility study but not carried forward due to limited future surrounding development based on current zoning. This Functional Plan recommends that these corridors be re-evaluated based on staff's current

recommendation for increased density in the White Oak Science Gateway Master Plan area. These corridor additions are proposed to be evaluated as part of a potential future phase. They are also shown in Figure 7¹² and described as follows:

- ▶ A connection between Rockville and the Georgia Avenue interchange for the ICC (Corridor A), by way of MD 28/Norbeck Road
- ▶ A connection between NIH and Wheaton (Corridor B), by way of the following roads:
 - Cedar Lane
 - Summit Avenue
 - Knowles Avenue
 - Connecticut Avenue
 - University Boulevard
- ▶ An extension of Corridor 14: Randolph Road from Glenmont Metro Station to US 29 (Corridor C), to provide connectivity to the planned White Oak Science Gateway
- ▶ An extension of Corridor 11: MD 650/New Hampshire Avenue from US29 to Randolph Road (Corridor D), to provide connectivity to the planned White Oak Science Gateway
- ▶ A connection between Aspen Hill and White Flint (Corridor E), by way of Parklawn Drive and Montrose Parkway

As stated in Chapter 1, on December 5, 2011, the RTTF forwarded recommendations for an expanded network of BRT corridors beyond what was proposed by the MCDOT study. The corridors that would be added beyond what has been identified above are as follows:

- ▶ An extension of Old Georgetown Road from Tuckerman Lane north to White Flint
- ▶ An extension of Wisconsin Avenue (MD 355) south from the Bethesda Metrorail Station to the District of Columbia Line

- ▶ An extension of MD355 from the terminus of the CCT in Clarksburg to the Frederick County Line
- ▶ An extension of US29 from the Burtonsville park-and-ride to the Frederick County Line
- ▶ Cherry Hill from US29 to the Prince George's County Line
- ▶ Georgia Avenue from the Silver Spring Transit Center to the District of Columbia Line
- ▶ A corridor from the Montgomery Mall Transit center to the American Legion Bridge via I-270 and I-495.

It is recommended that these corridors be added to the scope of work for consideration in the next phase of this Functional Plan. The Georgia Avenue segment (noted in the previous set of bullets) duplicates the alignment of a potential streetcar line that was the subject of a November 16, 2011 letter from Councilmembers Nancy Floreen and Hans Riemer to County Executive Isiah Leggett and to Mayor Vincent Gray (see Appendix E).

The total length of the network recommended to be evaluated in the next phase is approximately 139 miles, a reduction from the current 150 miles. It is likely that some of these corridors would merit only operational improvements and would not be included in the Functional Plan. Therefore, the corridor length of the final network is likely to be less than 139 miles. The additional corridors, however, will require more work to bring them to an equivalent level of development as the original corridors.

¹² An assessment of the proposed east-west corridors is subject to funding for an additional phase of the Functional Plan.

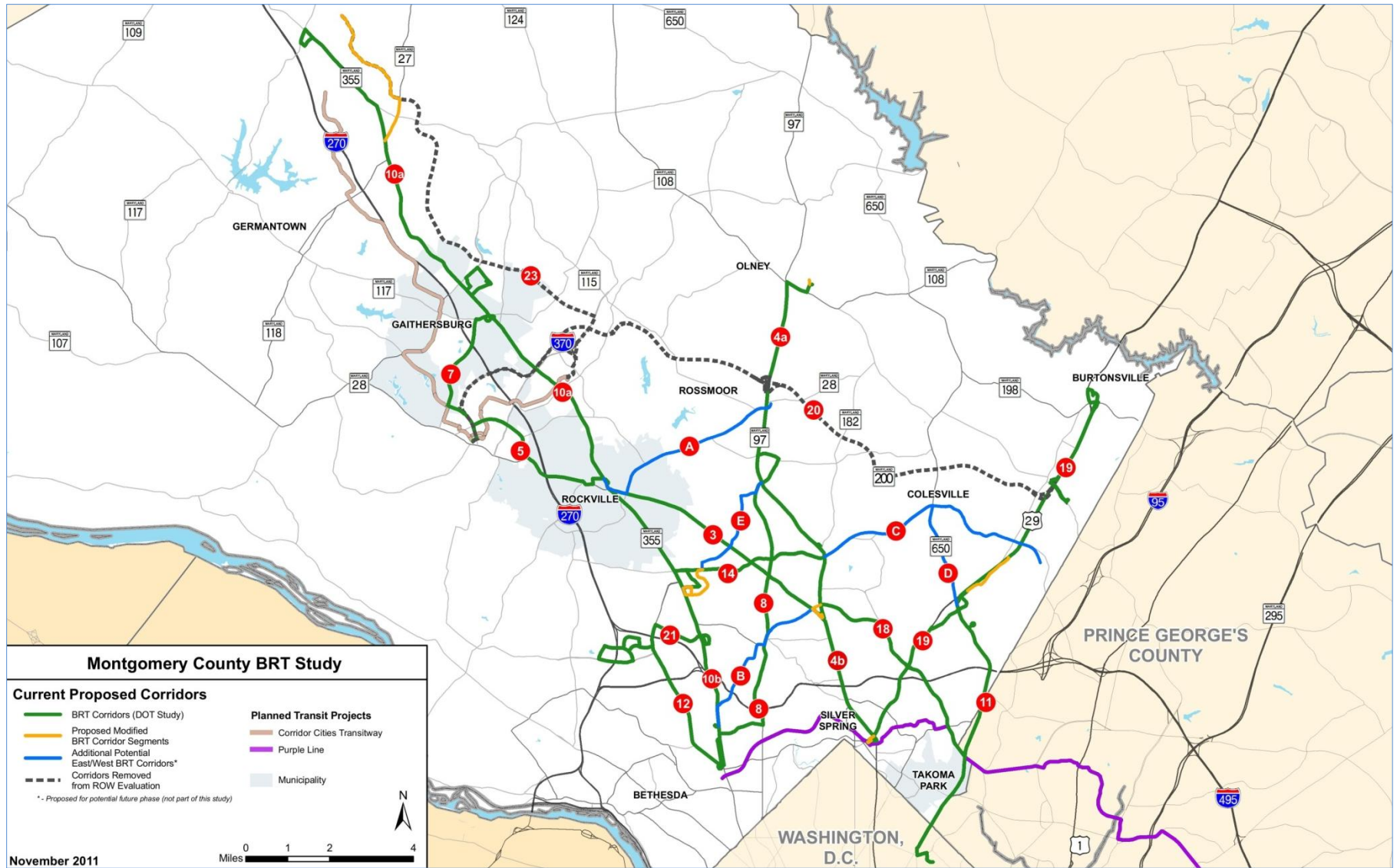


Figure 7. Modified functional plan network with potential east-west corridors

Chapter 4

Initial network analyses

This section summarizes the initial analyses conducted on the BRT network from the feasibility study. The information gained from these analyses contributed to the network modifications outlined in Chapter 4. Detailed discussions of these efforts are located in Appendix E.

The MCDOT feasibility study serves as a starting point for identifying the types of preferential treatments that are possible within the existing rights-of-way of the transit network's corridors. Our goal is to determine the highest level of treatment warranted to serve the forecast BRT ridership given best practices in transit planning. A methodology has been developed that provides the corridors with the greatest BRT passenger throughput receive recommendations for dedicated transitways.

This Functional Plan is intended to identify and protect the rights-of-way needed to accommodate the most appropriate treatment based on current analysis, not to prescribe that treatment. However, it will also maintain flexibility for the recommended treatment to be made for each

corridor. For example, a median transitway may appear to be the most appropriate treatment to accommodate dedicated bus lanes in a specific corridor. We will therefore recommend the greater right-of-way associated with that treatment, but during the implementation phase, curb lanes or intersection-based priority may prove to be more feasible or desirable.

Methodology for defining right-of-way needs

This Functional Plan presents a decision framework by which to assess right-of-way needs along segments of each transit corridor within the modified network. The right-of-way needs would be based on factors such as the following:

- ▶ AM and PM peak-hour BRT passenger volume along a corridor segment
- ▶ Area type of a corridor segment (i.e., urban vs. suburban)
- ▶ The level of traffic volume relative to the capacity of a corridor segment (also referred to as the v/c ratio)
- ▶ Each corridor's function, as defined in the Functional Plan
- ▶ The existing Master Plan right-of-way within the cross-section of a corridor segment

Key methodology policy issue

For corridors where passenger volumes exceed single lane person-throughput in automobiles, converting an existing travel lane to a bus lane is preferred to constructing an additional lane—as long as the volume-to-capacity ratio on the remaining travel lanes is less than 1.0 under 2040 conditions.

These data, in conjunction with other policy guidance, will provide the guidance for identifying the most reasonable and cost-effective treatments and rights-of-way needed to support high-quality transit within a given corridor segment. To this end, a decision framework, illustrated in Figure 8, was developed to be applied to the modified network for this Functional Plan. The framework gives three thresholds of peak-hour passenger volumes by which to identify the type of treatment or begin determining right-of-way needs along a BRT segment. One of the following treatment options could be recommended, depending on whether a segment is within an urban or a suburban environment:

- ▶ Assessing the roadway capacity to decide whether a **preferential or exclusive transit lane treatment** should be provided by either
 - Converting an existing roadway lane to a preferred transit lane, either during the peak period or the entire day¹³, or
 - Converting existing median space (with additional space if necessary) to an exclusive transitway (either in the center or in curb lanes) and providing supportive facilities—such as stations and shelters—within the existing rights-of-way.
- ▶ Providing **BRT priority with spot right-of-way requirements** at intersections to implement new or extended queue jumps
- ▶ Implementing **BRT priority** without cross-section modification, such as transit signal priority

While the feasibility study made every effort to identify corridors that could provide the level of high-capacity premium transit service desirable within Montgomery County, the benefits of implementing most or all of the characteristics of BRT must be weighed against both the financial investment and the potential impact to all

roadway travelers. BRT service operating along corridors that pass through multiple activity centers— where various trips are taken among those centers throughout the day—may warrant exclusive busway treatments at all times. On the other hand, transit service operating through primarily residential communities to connect passengers to a single major activity center or transit center may warrant exclusive transit lanes during the peak hours only.

The proposed framework relates the type of BRT facilities and, therefore, right-of-way needs to the following factors:

- ▶ A minimum volume of transit passenger, based on corridor segment in urban or suburban area

¹³ Depending on corridor conditions, it may be possible for a preferred transit lane to share its facility with non-transit vehicles, such as right-turning vehicles.

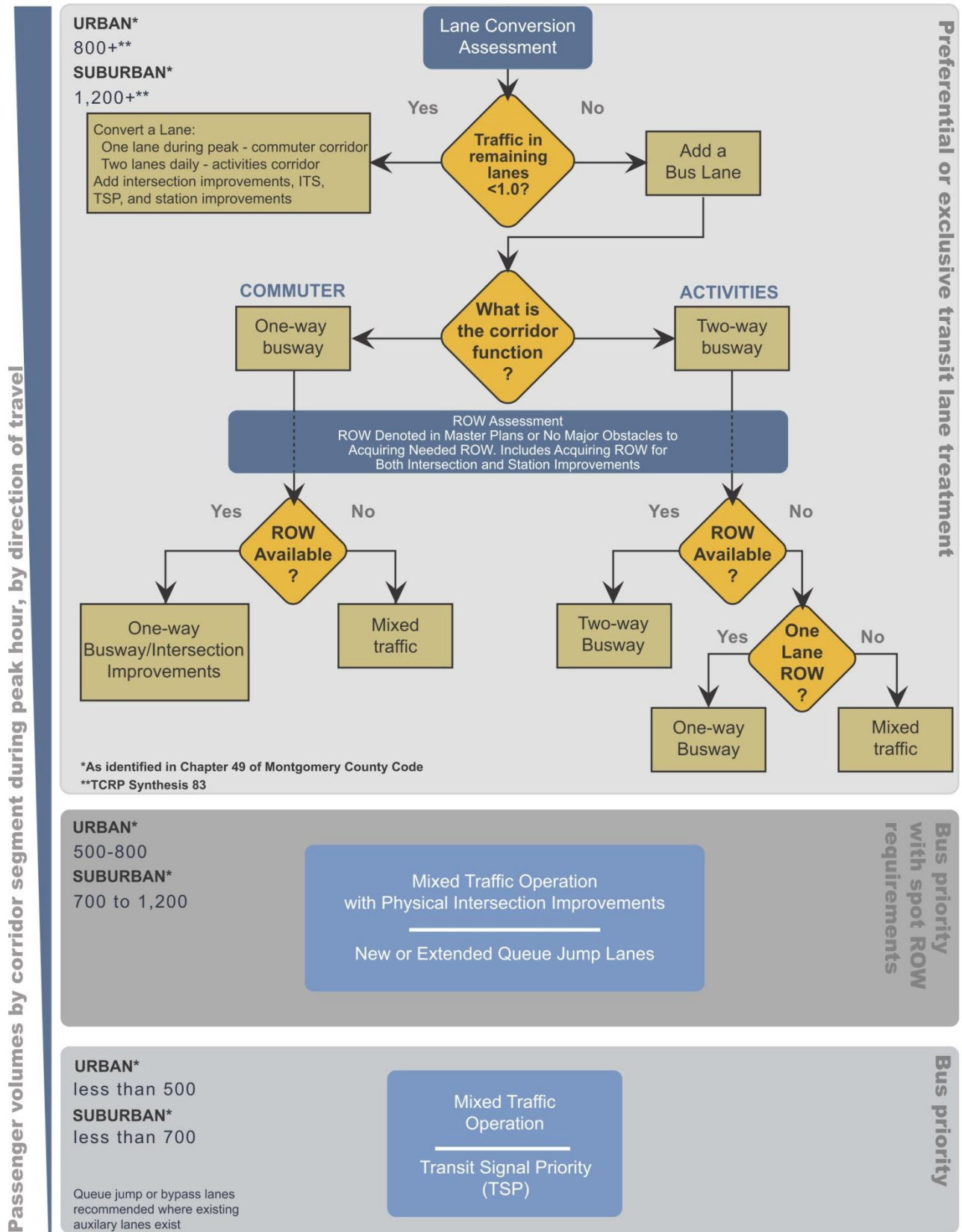


Figure 8. Decision framework for identifying right-of-way along BRT corridor segments

► BRT corridor functions

Commuter corridors can have high-frequency service, but would typically operate only during the peak period to make efficient and effective use of exclusive transit facilities. These lanes could then be made available to general traffic during the off-peak hours.

Activity center connector corridors are best able to meet FTA Small Starts requirements for all-day, high-frequency service within Montgomery County, having stops located every half-mile to mile among major activity centers and the ridership potential for implementing exclusive busways.

Link corridors, with lower ridership potential during the peak hours, could operate effectively with the benefit of intersection priorities such as queue jump lanes and signal priority.

Based on this understanding, 14 corridors from the modified transit corridor network will be advanced for assessing right-of-way needs. Table 3 lists the activity center connector and commuter corridors that would carry forward.

Bus priority

Corridors with fewer than 500 passengers per peak hour per peak direction in urban areas and fewer than 700 passengers per peak hour per peak direction in suburban environments would operate within a mixed-traffic environment, but benefit from signal priority to help increase operating speeds. Because no additional right-of-way would be needed to make the operational change, corridor segments requiring only this low level of treatment do not need to be included in this Functional Plan.

Bus priority with spot right-of-way requirements

Corridors with between 500 and 800 passengers per peak hour per peak direction in urban areas and between 700 and 1,200 passengers per peak hour per peak direction in suburban environments would operate within a mixed-traffic environment. However, they would benefit from an added lane dedicated to queue jump operations or extended existing auxiliary lane to advance vehicles ahead of the through general traffic queue and increase operating speeds. A new lane would be constructed from any available right-of-way within the cross-section of the corridor segment or through right-of-way dedication. Signal priority would also be recommended for corridor segments meeting this threshold. The requirement for additional right-

Table 3: Proposed Corridors for Right-of-Way Needs Assessment

Corridor Function	Proposed BRT Corridors
Activity Center Connector	Corridor 10a: MD 355 North Corridor 10b: MD 355 South Corridor 12: MD 187/Old Georgetown Road Corridor 18: MD 193/University Boulevard
Commuter	Corridor 3: MD 586/Veirs Mill Road Corridor 4a: MD 97/Georgia Avenue North Corridor 4b: MD 97/Georgia Avenue South Corridor 8: MD 185/Connecticut Avenue Corridor 11: MD 650/New Hampshire Avenue Corridor 14: Randolph Road Corridor 19: US 29
Link	Corridor 5: Rockville-Life Sciences Center Corridor 7: MD 124/Muddy Branch Road Corridor 21: North Bethesda Transitway

of-way for the recommended queue jumpers warrants the corridors inclusion in this Functional Plan, but queue jumpers alone do not meet the definition of a true transitway or busway. For example, because of the low forecast ridership, Corridor 8: MD 185/Connecticut Avenue would appear to be in that category.

Preferential or exclusive transit lane treatment

Corridors with more than 800 passengers per peak hour per peak direction in urban areas and more than 1,200 passengers¹⁴ per peak hour per peak direction in suburban environments would benefit from and would warrant exclusive transitway lane(s). The exclusive lane(s) would come from either converting an existing traffic lane to an exclusive transit lane, or identifying available right-of-way for constructing an exclusive median busway. The justification for converting a traffic lane would be that, during the peak hour, BRT vehicles could carry at least as many people within a lane along a corridor segment as could automobiles carrying the same amount of people. This would only be considered if the bus lane was expected to carry more people than a general-purpose lane would or if the v/c ratio for the other travel lanes did not exceed 1.0. If these criteria are not met, the availability of right-of-way to implement a one-lane or two-lane median busway would be determined. If no right-of-way was available due to significant physical constraints, BRT vehicles would need to operate in mixed traffic.

This methodology has been developed to determine what the appropriate level of person-throughput should be to justify recommending dedicated bus lanes as part of this Functional Plan. However, both MCDOT and the Maryland State Highway Administration are currently working to develop policies on this issue. We will incorporate these policies to the extent possible within the timeframe of this Functional Plan.

¹⁴ *TCRP Synthesis 83: Bus and Rail Preferential Treatments in Mixed Traffic* (2010)

Chapter 5

Outcome of the Functional Master Plan

Up to this stage of the Functional Plan, the following have been completed:

- ▶ Defined and assigned functions to each corridor in the proposed transit corridor network
- ▶ Defined station typologies for proposed BRT station locations
- ▶ Developed typical cross sections to determine right-of-way needs along proposed BRT corridors
- ▶ Conducted stakeholder meetings with MCDOT; SHA; MTA; Cities of Takoma Park, Gaithersburg, and Rockville; and WMATA to gather input on issues that could affect the proposed BRT corridors
- ▶ Revised corridor alignments for the modified BRT network

The next steps of the Functional Plan will assess the right-of-way needs for the corridors listed in Chapter 3 of this report, using the decision framework outlined in Figure 8. The study will further apply the typical cross sections to each corridor and identify the net right-of-way needs based on the existing Master Plan right-of-way. The process will also identify BRT station footprints using the defined station typologies as guidance. Additional work on the Functional Plan will provide general guidance on stormwater management needs along each corridor and determine how to accommodate those needs within the identified rights-of-way.

Once right-of-way needs are determined for the BRT corridors proposed for inclusion in Functional Plan, the results will be presented to the Planning Board and at public hearings throughout the County. Comments received during these outreach efforts will be incorporated into a final draft document, which will then be reviewed by

Planning Board before being presented to County Council for approval and adoption.

The Functional Plan will also include the following deliverables:

- ▶ Identifying areas where additional rights-of-way will be required or locations where travel lanes will be repurposed
- ▶ Recommendations for designating Bicycle-Pedestrian Priority Areas around BRT stations

Recommended additional analysis

This work effort is being conducted based on analysis performed as part of the study for the MCDOT. This prior analysis was conducted at a countywide feasibility level. Findings would be improved by adding more specific technical detail to the demand forecasting model effort conducted for that study. This additional effort would include the following:

- ▶ Updating the model to reflect local bus network improvements underway for the Corridor Cities Transitway project
- ▶ Reflect refined station location edits as identified by M-NCPPC staff
- ▶ Updating land use assumptions to reflect ongoing master planning efforts
- ▶ Updating assumptions for modal decision-making based on a finalized list of expected design treatments
- ▶ Updated assumptions based on the anticipated level of local bus service after implementation of the BRT network.

There is also additional technical analysis that could contribute to policy discussions associated with this Functional Plan. That analysis includes the following:

- ▶ Conducting analysis to determine impacts of a lane repurposing policy on the larger transportation network
- ▶ Understanding the mode choice implications of a lane repurposing policy to estimate how

many people would be expected to shift to transit if roadway conditions were to become more congested

- ▶ Conducting forecasting on additional corridors identified by the Rapid Transit Task Force for an expanded network and by Planning Board to improve east-west travel options
- ▶ Developing a final network, which incorporates all final policy recommendations to determine new ridership estimates for the transit corridor network

Chapter 6

Public outreach

The focus of the outreach effort thus far has been to share information about our Scope of Work and collect reactions and comments from the public, community leaders, agency representatives, and elected officials about the proposed network.

The outreach effort includes the following components:

- ▶ **Project website:** A website was established during the first phase of the project where members of the public can provide comments. As the information becomes available the website will include depictions of areas where additional right-of-way is likely to be needed.
- ▶ **Stakeholder Outreach:** Briefings were provided to staff of the Executive, County Council, Maryland Department of Transportation; WMATA; and the Cities of Rockville, Gaithersburg, and Takoma Park. Their comments and concerns have been requested; and information on projects, policies, and plans that could be affected by the implementation of the draft transit corridor network have been received.
- ▶ **Technical working group:** There will be continued meetings with the above stakeholders to keep them apprised of our

progress and to solicit their further comments. In addition, invitations will be extended to meet with representatives of the Washington Suburban Sanitary Commission (WSSC), PEPCO, and Frederick, Howard, and Prince George's Counties, as well as the District of Columbia.

- ▶ **Public meetings:** Two public meetings were held at the Montgomery Regional Office (MRO) on October 24, 2011 and another on November 29, 2011 at the Upcounty Regional Services Center. Comments received at these meetings are shown in Appendix F. Future meetings to present the draft recommendations and solicit feedback will be conducted at MRO and at regional service centers. Additional meetings could also be conducted for specific corridors.
- ▶ **Planning Board public hearing:** The public will have the opportunity to provide testimony on the Public Hearing Draft Plan and to submit comments for a period after the public hearing.

Chapter 7

Proposed project timeline

Figure 9 shows the proposed project timeline. While every effort will be made to adhere to the schedule, other decisions may affect project analysis and delivery, including direction from the County Council on the Planning Board's approved Network and Methodology Report. Namely, the following items could significantly affect the project:

- ▶ Possible analysis of additional BRT corridors proposed for the transit corridor network
- ▶ Additional modeling to determine impacts of BRT implementation on traffic based on the revised network, including the impact on other roadways
- ▶ Additional modeling to refine ridership forecasts based on the revised network

- ▶ An assessment of the impact of the implementation of BRT service on existing transit service
- ▶ County and/or State decisions on person-throughput policies

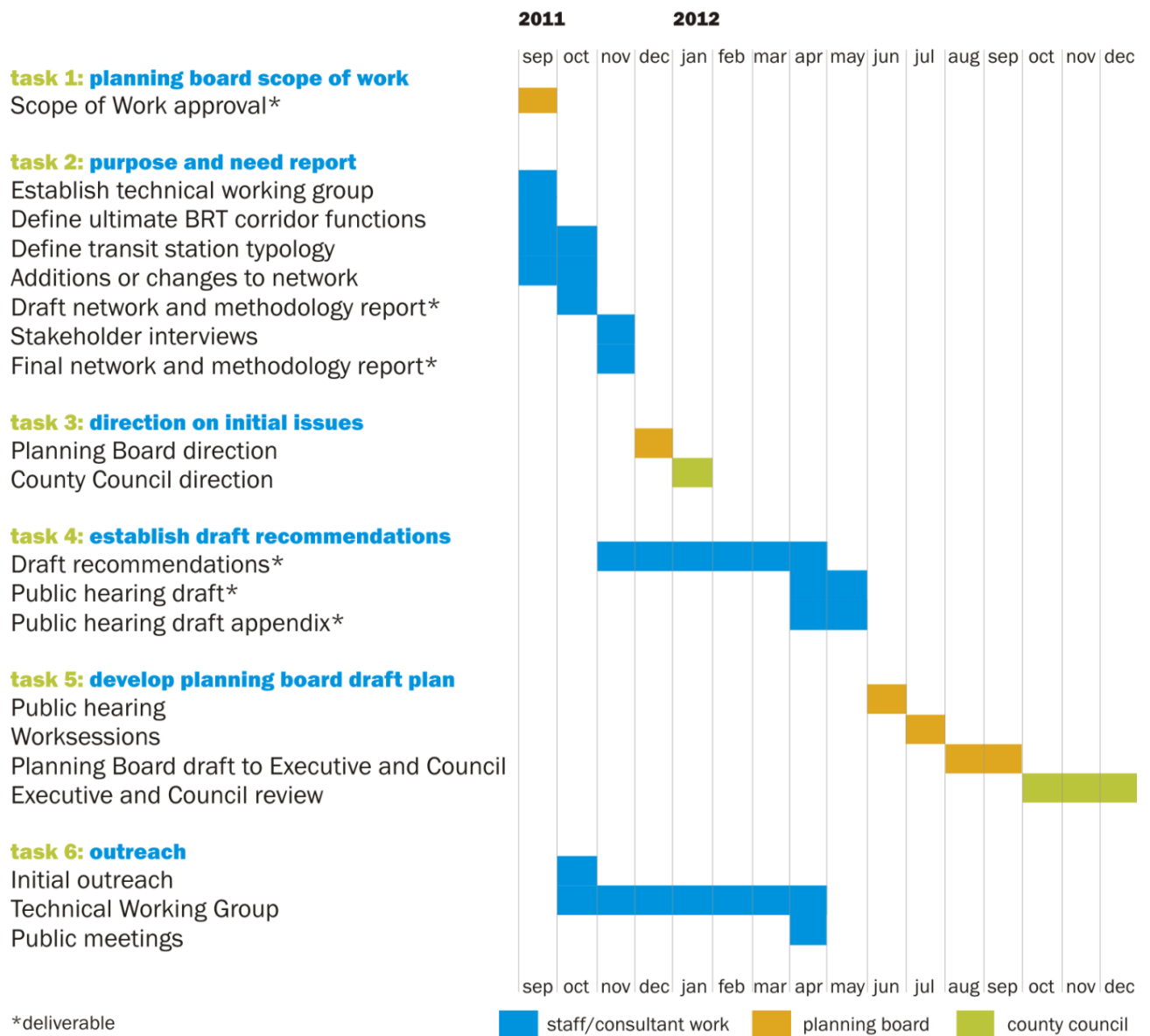


Figure 9. Countywide transit corridors functional master plan schedule

Appendix A—Transportation goals, objectives, and strategies, Montgomery County General Plan (1993)

60 Growing public anger over the intrusion of traffic into once tranquil suburban communities could very well be the impetus to sweeping public-private initiatives and reforms.

—Robert Cervero

approved & adopted december 1993

SCOPE

The Transportation Goal of the General Plan Refinement places renewed emphasis on quality of life considerations, sustained mobility, and appropriate access for Montgomery County's residents and workers. Emphasis is placed on the relationship of Transportation to other goals of the Refinement, especially in the areas of land use, housing, environment, and economic activity. This goal also addresses the need to operate more efficiently in moving people and goods from, to, through, and within Montgomery County. The Refinement focuses not only on transportation infrastructure — its type, scale, location, and extent — but also on the public policies needed to meet mobility, access, and quality of life considerations.

KEY CONCEPTS

While some increases in traffic congestion may be a fact of life for the future, maintaining mobility is essential. Making better use of the transportation system already in place, getting more people into trains, cars, and buses in future rights-of-way, and creating an environment conducive to walking and biking are all necessary elements to achieve an affordable balance between the demand for, and supply of, transportation. Even with a more efficient use of the existing transportation system, additions to the network will be necessary to support this Refinement's Land Use Goal. Public safety is a primary concern in the design of transportation facilities.

TRANSPORTA

*goals, objectives and strategies***CHANGES FROM THE 1969
GENERAL PLAN UPDATE**

The 1969 Circulation Goal was to “provide a balanced circulation system which most efficiently serves the economic, social, and environmental structures of the area.” The General Plan Refinement renames the goal to the Transportation Goal. One important conceptual change in this goal is the movement away from accommodating travel demand and towards managing travel demand and encouraging the availability of alternatives to the single-occupant vehicle. The Refinement effort thus abandons phrases such as “carry the required volume” and “accommodate travel demand” because the demand for single-occupant vehicle travel will usually outstrip the County’s ability to meet it.

The concept of transit has broadened to include provisions for high occupancy vehicles. Largely because of increased affluence and changes in commuting patterns, the rate of drive-alone commuting is higher today than at the time of the 1969 General Plan Update. An important challenge for the future will be making transit more price- and time-competitive with drive-alone travel. As was recognized in the 1969 General Plan Update, it is vitally important that the emerging multi-modal transportation network be well-connected and that transferring among the component parts be as convenient as possible.

The General Plan Refinement supports walking and biking as legitimate means of travel beyond the health, recreation, and aesthetic dimensions ascribed to them by the 1969 General Plan Update. Expanding the current network of sidewalks and bike paths and bringing related land uses within walking distance of

each other are steps in the right direction.

The General Plan Refinement also acknowledges the importance of strategic transportation pricing in managing future transportation demand. Subsidies, user fees, and taxes all can be used to balance some of the cost differentials that have traditionally been found among the different modes of transportation.

**INTERRELATIONSHIP WITH
OTHER GOALS****Land Use**

Realizing Montgomery County’s potential for economic growth, while preserving its natural resources and making efficient use of its fiscal resources, means supporting the compact development of mature, developing, and future centers. Concentrations of mixed-use centers are well suited to the transitways that are planned for the County’s future. According to surveys, per capita work trips have decreased and non-work trips have increased. Developing land use planning strategies that co-locate uses typically requiring multiple trips will reduce the length of, and demand for, non-work trips.

Housing

The Housing Goal supports many of the concepts in the Transportation Goal. Encouraging the development of housing near transit stops and ensuring that housing in mixed-use zones is developed in a timely manner will reduce travel demand for single-occupant vehicles and will provide greater opportunities for transit. One Housing strategy proposes to “encourage housing plans that foster transit serviceability.” The concern for development of affordable housing near transit and near employment opportunities will provide County residents with the “choices in the modes and routes of travel” stated in a Transportation objective and will provide greater accessibility to jobs, recreation, and shopping for all County residents.

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TION

General Plan Refinement approved & adopted December 1993

Economic Activity

A well-functioning transportation system is a necessity to keep businesses viable and to attract new firms and residents to the County. Several challenges lie ahead. One is to decide how transportation use should be paid for. Should transportation be treated more as a utility, in which users of the system pay for the goods they consume, or should public funds provide more support to recognize the general benefits of moving people and goods? Another challenge is how to retain and attract employers while asking them to take increased responsibility for managing transportation demands.

Environment

The original Circulation Goal was conceived before the first clean air legislation was enacted in 1970. Subse-

quent transportation, health, and environmental legislation provide strong incentives and sanctions to attain and maintain prescribed limits on vehicle emissions, provide flexibility on how transportation money is spent, and modify regional institutional arrangements for meeting these concerns.

The potential for conflict among Refinement goals is probably greatest between Transportation and Environment. The construction and use of transportation systems often have environmental costs. A major challenge will be to create transportation options that harmonize with the environment yet match the demands placed on the transportation network by the planned land use. One such example, supported by the General Plan Refinement, is a concept that has emerged from the increased environmental sensitivities of the 1980s and 1990s known as greenways. Greenways are linear corridors of open space, such as the County's stream valley parks, that protect the natural environment. Walking and biking trails, often a fea-

Grosvenor Metro Station.

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goals, objectives and strategies

ture of greenways, provide opportunities to forge connections that are alternatives to motorized travel between highly developed and less developed areas of the County.

Community Identity and Design

The Transportation Goal also looks at communities, understanding that they are often adversely affected by transportation improvements, through traffic, excessive speeds on local streets, and noise. Neighborhood streets are part of a larger network that depends upon a high degree of interconnectedness to function properly. The General Plan Refinement acknowledges the importance of the detailed, small-scale network of sidewalks that connects residents to each other's homes and to nearby shopping centers, schools, and other community facilities. Creating communities conducive to walking and biking will help improve the sense of community within the County's neighborhoods.

Regionalism

The Transportation and Regionalism Goals are closely interrelated. The existence of interstate highways, state roads, and regional transit networks within the County ensures that Montgomery County must coordinate with other jurisdictions in the region on transportation issues. Open dialogue and coordinated planning regionwide is the prelude to laying down pavement and rails, or establishing transport policies. Clean air and transportation legislation provide strong incentives for regional planning. Seeking and advancing shared interests must overcome divisive trends, such as complaints of "external" traffic clogging County roads, that have provided natural incentives for acrimonious finger pointing across borders.

Compliance with Maryland Planning Act of 1992

The Transportation Goal seeks to conserve resources (Vision 5) by encouraging public and private efforts to reduce peak travel demand (Strategy 3A), devise land use patterns to encourage shorter trips (Strategy 3B), and to manage the supply of parking (Strategy 3E). The require-

ment to provide funding mechanisms to achieve other Planning Act visions (Vision 7) is addressed by Strategies 1E and 1F. Objective 7, preventing degradation to the overall quality of air, land, and water, addresses stewardship of the Chesapeake Bay (Vision 4).

GOALS, OBJECTIVES & STRATEGIES

Enhance mobility by providing a safe and efficient transportation system offering a wide range of alternatives that serve the environmental, economic, social, and land use needs of the County and provide a framework for development.

OBJECTIVE 1

Develop an interconnected transportation system that provides choices in the modes and routes of travel.

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Strategies

- A. Identify and protect rights-of-way for the future transportation system.
- B. Give priority to improving east-west travel.
- C. Encourage regional, State, and federal agencies to implement transportation system improvements, including accessibility to other jurisdictions in a manner which is consistent with County goals.
- D. Ensure that transportation system designs recognize the mobility needs of people with disabilities and other special populations.
- E. Continue to require the private sector to share in the cost of improving the transportation system.
- F. Embrace cost effective technologies, policies, and techniques that promote efficiency and safety in the transportation system.

transmission refinement approved & adopted december 1993

OBJECTIVE 2

Provide appropriate access to, around, and within communities by using a full range of travelways.

Strategies

- Assure that access is provided to each parcel of property in the County.
- Establish network plans for all modes of transportation.
- Match land uses and intensities to appropriate travelways.

OBJECTIVE 3

Improve the efficiency of the existing and planned transportation system by managing its supply and demand.

Strategies

- Encourage public and private efforts to reduce the peak demand for travel through means such as flexible work schedules, off-site work arrangements, pricing, and telecommuting.
- Devise mixed land use strategies that encourage shorter trips.
- Increase the occupancy of automobiles and transit through such means as pricing, high occupancy vehicle lanes, and other priority treatments.
- Establish transportation management districts and other programs that reduce the number of vehicle trips.
- Manage the supply and price of parking to encourage transit use, car-pooling, walking, and biking.

OBJECTIVE 4

Provide a transit system in appropriate areas of the County that is a viable alternative to single-occupant vehicle travel.

Strategies

- Scale the extent and frequency of transit service in proportion to its potential benefit.
- Give priority to establishing exclusive travelways for transit and high occupancy vehicles serving the Urban Ring and Corridor.
- Establish development patterns that support public transportation.
- Locate buildings, roads, bikeways, and walkways, and manage automobile traffic to provide convenient access to transit services.
- Provide for station locations that minimize the number and/or duration of transfers.
- Provide transit users with shelters, paved waiting areas, lighting, schedule information, and safe pedestrian crossings at significant transit locations.
- Make transit use more price- and time-competitive with auto use.

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FIGURE 14 Corridor Cities Transitway (Future)



*goals, objectives and strategies***OBJECTIVE 5**

Reduce traffic delays on the road system without eroding the quality of life in surrounding communities, unless alternatives to the single-occupant vehicle are available.

Strategies

- A. Provide a sufficient number of major highways, arterial roads, and primary streets to attract through traffic away from local streets.
- B. Allow designated rustic County roads in the Agricultural Wedge to remain in their present condition, except for maintenance and safety projects.
- C. Facilitate the efficient flow of vehicles and minimize delay through means such as the use of a County-wide signal system and advanced traffic management technology to minimize the need for more road rights-of-way.
- D. Give preference to underpasses rather than overpasses in developed areas where the construction of a grade-separated interchange is deemed necessary.

OBJECTIVE 6

Provide pedestrians and bicyclists safe, direct, and convenient means of travel for transportation and recreation.

Strategies

- A. Consider safe bikeways and walkways as integral parts of all land development and transportation projects.
- B. Provide a bikeway network that serves a variety of needs for a variety of users.
- C. Increase pedestrian and bicyclist access to and within neighborhoods, commercial centers, school grounds, and other public places.
- D. Encourage reduced building setbacks that result in convenient walking distances between the public rights-of-way and buildings.
- E. Provide secure bicycle storage at all major transit stations, retail areas, employment centers, and other activity centers.

- F. Encourage pedestrian circulation by managing through traffic in centers and safe crosswalks.

OBJECTIVE 7

Prevent degradation to the overall quality of the air, land, and water in the provision and use of the transportation system.

Strategies

- A. Avoid, minimize, or mitigate impacts on wetlands, watersheds, forests, and other natural resources.
- B. Give priority to transportation projects and policies that promote efficient use of energy and attain clean air standards.
- C. Support land use decisions by encouraging alternatives to the internal combustion engine and the use of fossil fuels.
- D. Protect neighborhoods from excessive road noise.
- E. Support land use decisions by reducing negative impacts on water quality from water and chemical road runoff and from pollutants emitted by the internal combustion engine.

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OBJECTIVE 8

Maximize safety in the use of the transportation system.

Strategies

- A. Design roads to allow drivers to react safely and to allow safe travel through neighboring communities.
- B. Provide improved travelways and transfer points that enhance visibility, personal security, and safety, particularly for pedestrians and bicyclists.
- C. Enable automobiles, pedestrians, and bicyclists to coexist safely on roads and streets in residential and commercial areas.
- D. Provide safe, well-lit, and clearly marked pedestrian crossings where needed.
- E. Eliminate at-grade railroad crossings on major roadways.

Appendix B—Relevant planning activities within Montgomery County

Overview of recent and current master and sector plans

Master plans provide the strategic or overall guidance for a planning area, while sector plans provide details for how the growth and/or development will occur for a smaller subarea. Many of the areas discussed below have recently completed plans that recommend increased transit. In the following pages are a summary of some of the recommendations.

Takoma/Langley Crossroads Sector Plan—The vision described in the Planning Board Draft from May 2010, while not directly referring to BRT, is supportive of additional transit in the area. The vision is for Takoma/Langley Crossroads to be “a transit-oriented, pedestrian-friendly community (p. 13)” with “an effective and efficient multimodal transportation system that accommodates development near the proposed Purple Line and Takoma/Langley Park Transit Center and provides for regional mobility (p. 7).” An element of the plan that specifically supports proposed BRT Corridor 11: MD 650/New Hampshire Avenue is one of the five public transit recommendations: “Study the feasibility of a Purple Line spur that will connect the Transit Center with the White Oak Transit Center serving FDA’s Headquarters site via New Hampshire Avenue (p. 36).” The plan also calls for reconfiguring New Hampshire Avenue as a 150-foot multi-way boulevard that would accommodate on-street bicycle lanes (shown in Figure B-1), as well as a 120-foot cross section for University Boulevard that accommodates on-street bicycle facilities and the Purple Line operating in the median (shown in Figure B-2). Any rights-of-way for BRT would need to be coordinated with each of these recommendations.

New Hampshire Avenue Corridor Concept Plan—As with the Takoma/Langley Park Crossroads Sector Plan, this Plan envisions a multi-way boulevard that would “provide a safer environment for pedestrians and a stronger pedestrian-oriented retail experience (p. 35)” in the City of Takoma Park. Within the 150-foot cross section shown in Figure B-3 would be two through travel lanes in each direction, with the inside travel lane facilitating transit vehicles and bus pullouts to serve passengers from side medians.

Kensington Sector Plan—The emphasis of the Planning Board Draft, June 2011 is creating an active town center, and there is limited discussion of transit. However, the Sector Plan does mention that Montgomery County is studying the feasibility of BRT and that Connecticut Avenue is one of the corridors being studied. The sector plan goes on to say “Bus rapid transit planning results completed to date indicate that the [Sector] Plan’s recommended typical section is appropriate, although additional right-of-way needs may be identified for bus priority treatments at specific locations in the Plan area during subsequent design studies (p. 9).” Figure B-4 illustrates the proposed cross section along Connecticut Avenue.

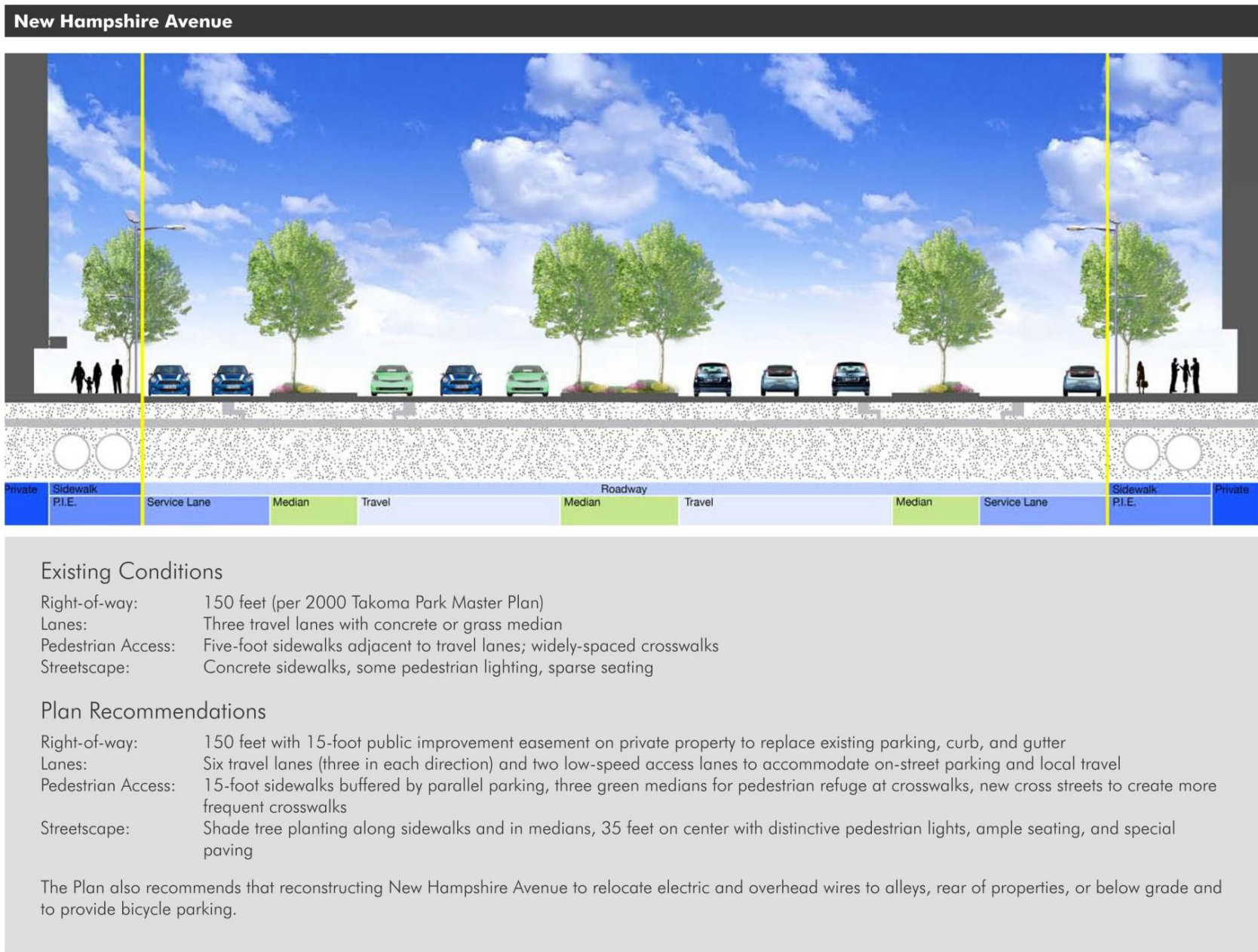


Figure B-1: Multi-way boulevard concept for New Hampshire Avenue

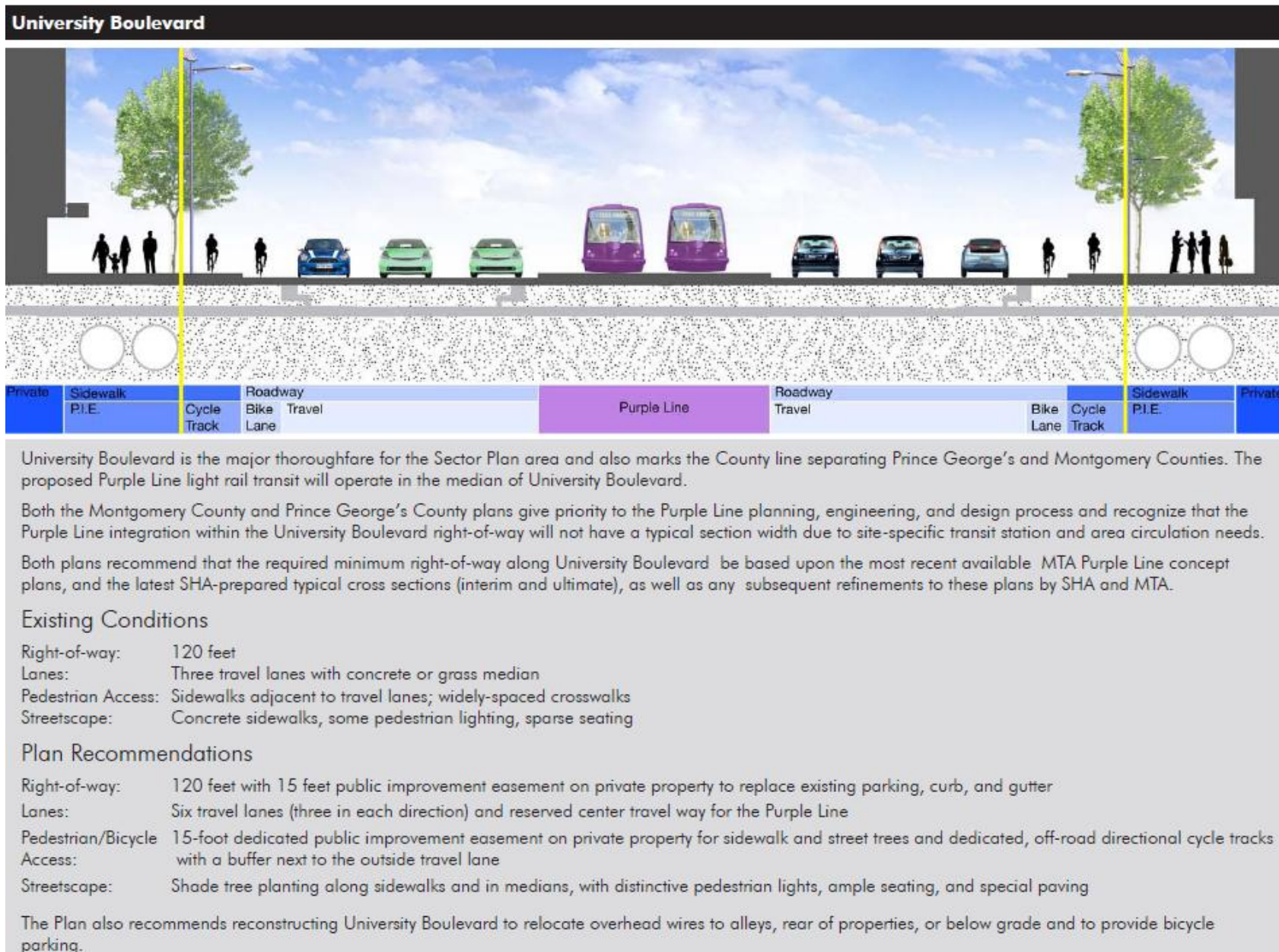


Figure B-2. Proposed cross section for University Boulevard

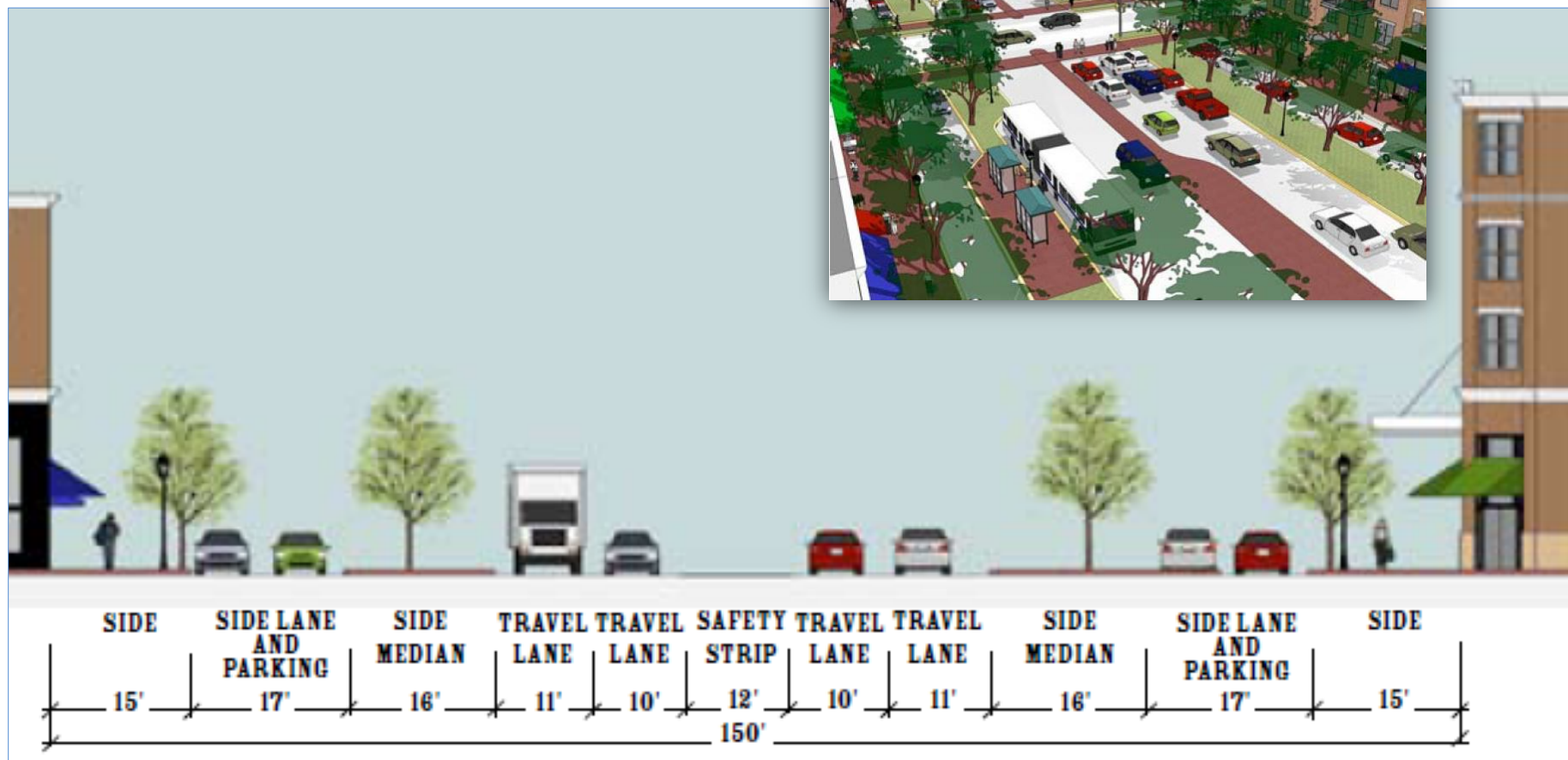


Figure B-3: Proposed multi-way boulevard concept and cross section along New Hampshire Avenue



Figure B-4: Proposed cross section for Connecticut Avenue

Wheaton CBD and Vicinity Sector Plan—One of Wheaton’s strengths identified in the June 2010 Public Hearing Draft is its “excellent access to public transit” and its “multi-modal transportation capacity (p. 13).” The proposed inclusion of four BRT lines in Wheaton continues and supports this strength. Potential conflicts between the Sector Plan and the proposed BRT routes relate to how the community would want Georgia Avenue, University Boulevard, and Veirs Mill Road to interact with the surrounding areas. The Plan’s mobility recommendations propose redesigning Georgia Avenue, University Boulevard, and Veirs Mill Road as “urban boulevards with enhanced medians and crosswalks, street trees, and street-oriented retail where appropriate (p. 41).” Cross sections for the following four corridors would need to be reconciled with the plan’s proposed redesign of these major thoroughfares:

- ▶ Corridor 3: MD 586/Veirs Mill Road
- ▶ Corridor 4a: MD 97/Georgia Avenue North
- ▶ Corridor 4b: MD 97/Georgia Avenue South
- ▶ Corridor 18: MD 193/University Boulevard

Long Branch Sector Plan—Preliminary recommendations on the Plan made to the Planning Board in December, 2010 indicate that key “wish list” items generated through a public outreach exercise include “access to transit” and “intersections that work.” The document also indicates a desire to turn University Boulevard into a “complete street”. While BRT is not mentioned in the document, proposed BRT Corridor 18: MD 193/University Boulevard can help achieve these objectives.

Comprehensive Amendment to the Bethesda/Chevy Chase Master Plan—One of the goals of the approved and adopted 1990 Plan is “Achieve a significant shift of new travel from auto to transit and other mobility alternatives (p. 2).” The Plan’s transportation goal is to “achieve a significant shift of new travel from auto use to transit and other mobility alternatives” and the first objective is to “provide an expanded and vigorous program of expanded transit and other mobility services and facilities (p. 19).” These statements would suggest that expanding transit services in the study area would be consistent with the proposed BRT plan. One potential area of conflict is the Plan’s Green Corridors Policy, which calls for a “policy of maintenance and enhancement of Green Corridors along the major highways of the Planning Area.” Balancing the desire for increased transit, maintaining traffic operations at an acceptable level of service, minimizing impacts to adjacent properties, and maintaining a good aesthetic character is most difficult in densely developed areas of the downcounty.

US 29 / Cherry Hill Transit-Oriented Development Scenario Planning Report—The report prepared in June 2011 finds that BRT and light rail transit (LRT) “are promising in that ridership goals seem achievable (p. iii)” for the level of higher-density investment envisioned with East County Science Center. It also states, “An extension to Konterra and Muirkirk is likely more cost-effective (as it will capture more ridership) than to Briggs-Chaney (p. iii).”

Bus Rapid Transit Update, White Oak Science Gateway Master Plan, Citizens Advisory Committee (CAC), September 20, 2011—In a presentation to the CAC, the committee was shown an early concept for a BRT network in the ECSC (see Figure B-5). Three of the five stops shown are on proposed Corridor 11: MD 650/New Hampshire Avenue. The other two stops are not served by a BRT route currently being studied as part of this Functional Plan, but are recommended to be added to our scope of work for the next phase.

Clarksburg Master Plan and Hyattstown Special Study Area—The 1994 Plan emphasizes the need for transit and states “the importance of transit to the future development of the Clarksburg/Hyattstown area cannot be underestimated.” The plan “includes a regional transitway which will be part of a larger transit network extending south to Germantown and Shady Grove and will ultimately extend north to the City of Frederick (p. 22).” The study identifies a proposed roadway cross section that accommodates a median BRT transitway, shown in Figure B-6.

2002 Comprehensive Master Plan and Rockville Pike Plan 2010 (Draft)—The City of Rockville is currently updating its 2002 Comprehensive Master Plan. The implementation of its review (conducted from 2008 to 2009) will be phased. The first phase, which expected to be completed by 2012, includes creating and adopting its plan for Rockville Pike.

Throughout the City of Rockville, about 75% of the land use is zoned as residential. Commercial land uses—primarily focused along Rockville Pike and within the City’s designated Town Center planning area—occupy less than five percent of the land use in the City. Rockville Pike currently carries over 54,000 vehicles daily, with 3,000 vehicles per hour driving along it during each peak direction of travel. Development patterns

along the Pike—primarily consisting of retail with extensive surface parking—cause multiple vehicle trips to complete errands.

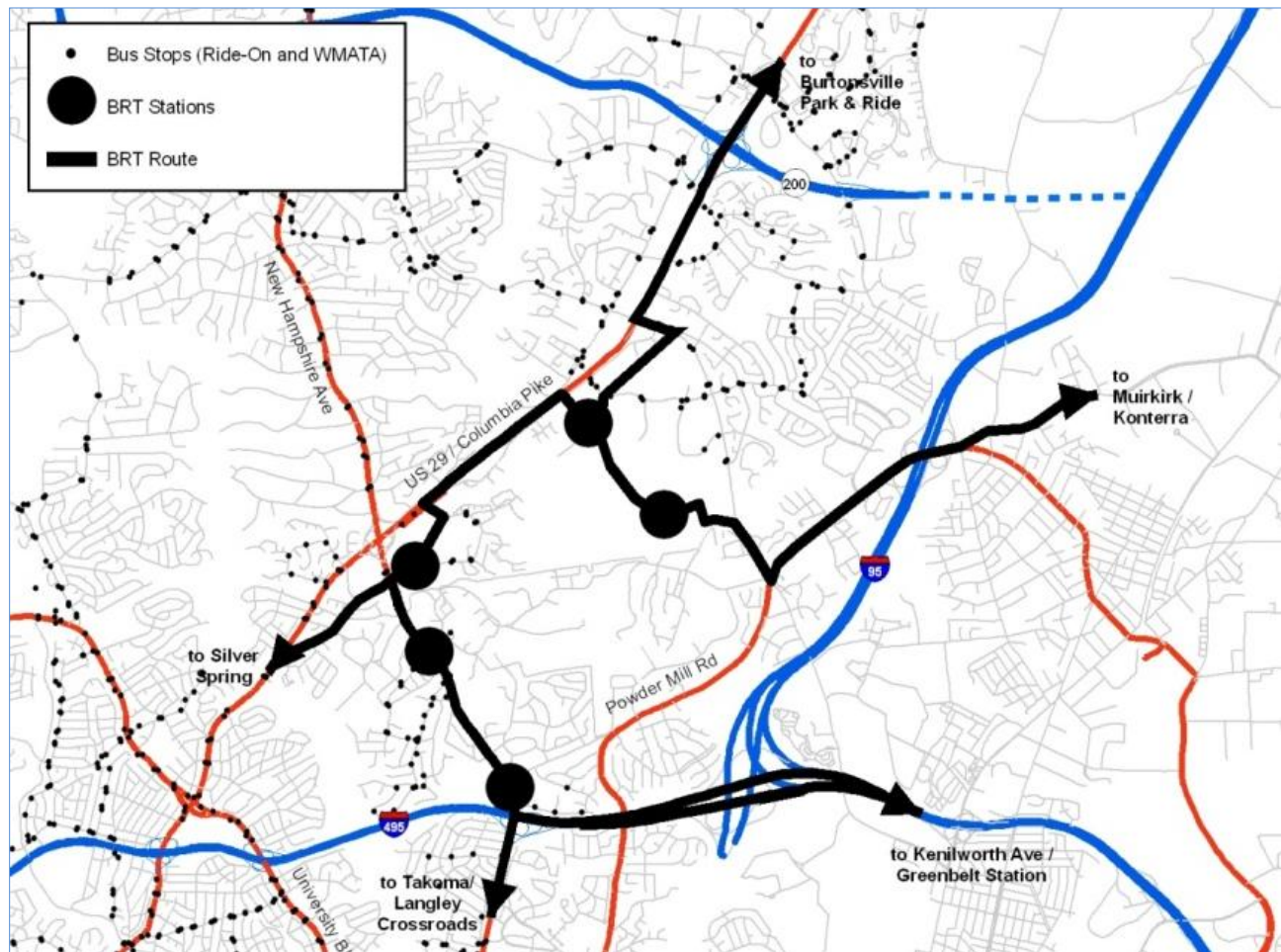


Figure B-5. Proposed BRT stations within the White Oak Science Gateway Master Plan Area

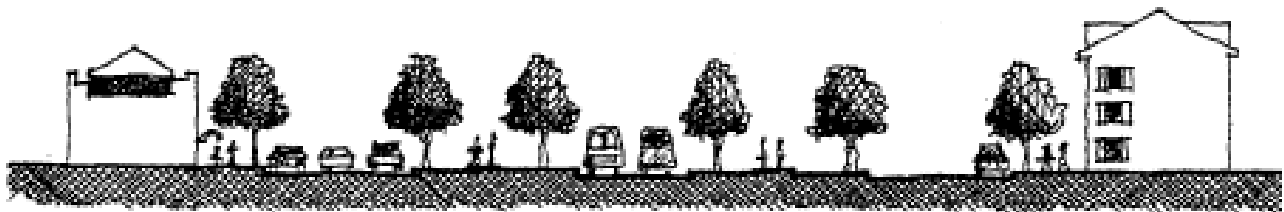


Figure B-6. Proposed Cross Section with Median Transitway along Observation Drive in Clarksburg

The City sees the Red Line, coupled with local bus, as having “outstanding potential as a means of mobility for people traveling to and from the Pike corridor (p. ii).” It also would like to increase the Pike’s viability, attractiveness, and friendliness of its pedestrian environment.

Thus, the Rockville Pike Plan provides a number of key recommendations that would directly affect Corridor 10b: MD 355 South. At the core of its recommendations is the redevelopment of Rockville Pike as a multi-way boulevard that accommodates both visitors and residents. This could help facilitate a mode shift “from

a high degree of reliance on the private automobile to more diverse transportation choices (p. vi).” The plan would prefer maintaining the existing 84-foot curb-to-curb right-of-way as six travel lanes for through vehicular movements and add two-lane access roads in each direction, provided for buses, bicycles, and local land-use access. However, discussions with City staff indicate the consideration of two alternative cross-sections that could accommodate BRT vehicles within the existing 120-foot state right-of-way.

The first alternative would provide a 50-foot median transitway for BRT vehicles and maintain local bus service in the curb lanes of the expanded cross-section for travel lanes. The overall cross-section would be 236 feet. This is shown in Figure B-7. The second alternative would reduce the overall cross-section to 227 feet by having all transit vehicles operate in outside travel lanes within an expanded cross-section for travel lanes. This is shown in Figure B-8.

Additional recommendations that will affect proposed the BRT corridor along Rockville Pike include the following:

- ▶ Integrating Twinbrook Metrorail station into the Rockville Pike corridor to increase access to and use of the station
- ▶ Applying development principles to provide for mixed-use development, modifying building height standards, and reducing building setbacks to improve the pedestrian environment
- ▶ Implementing mechanisms that would affect development capacity in the area
 - Increasing traffic capacity through roadway and intersection redesigns
 - “Increasing the Critical Lane Volume standard together with adopting a more flexible system of capacity allocation to reduce the number of intersections along the Pike that exceed the Comprehensive Transportation Review threshold, thereby permitting more development (p. viii).”

City of Gaithersburg 2009 Master Plan Update

The City of Gaithersburg is currently in the process of updating its 2003 master plan. It has already adopted an updated transportation element (September 2010). The current rail and bus transit mode share for City commuters is about 16 percent. Gaithersburg is served directly by Ride On, MARC’s Brunswick Line, and Metrobus; and has two park-and-ride lots adjacent to I-270. Express bus provides access to the Lakeforest Mall Transit Center and Shady Grove Metrorail station. The City would like to increase connectivity within its boundaries and opportunities for alternatives to travel by single-occupant motorists. To this end, it supports the development of the Corridor Cities Transitway to connect residents to Clarksburg and Shady Grove Metrorail station. However, it recognizes the need to supplement the Corridor Cities Transitway with additional transit service and sees the transit corridor network proposed by MCDOT as a major contributor toward this solution. The City proposes that continued progress on the network provide recommendations on right-of-way needs along BRT corridors identified within the City: MD 355 and Muddy Branch Road.

Gaithersburg has areas of special transportation concern. One of these areas is the Frederick Avenue (MD 355) corridor, along which the BRT feasibility study identified two corridors.

- ▶ Corridor 7: MD 124/Muddy Branch Road
- ▶ Corridor 10a: MD 355 North

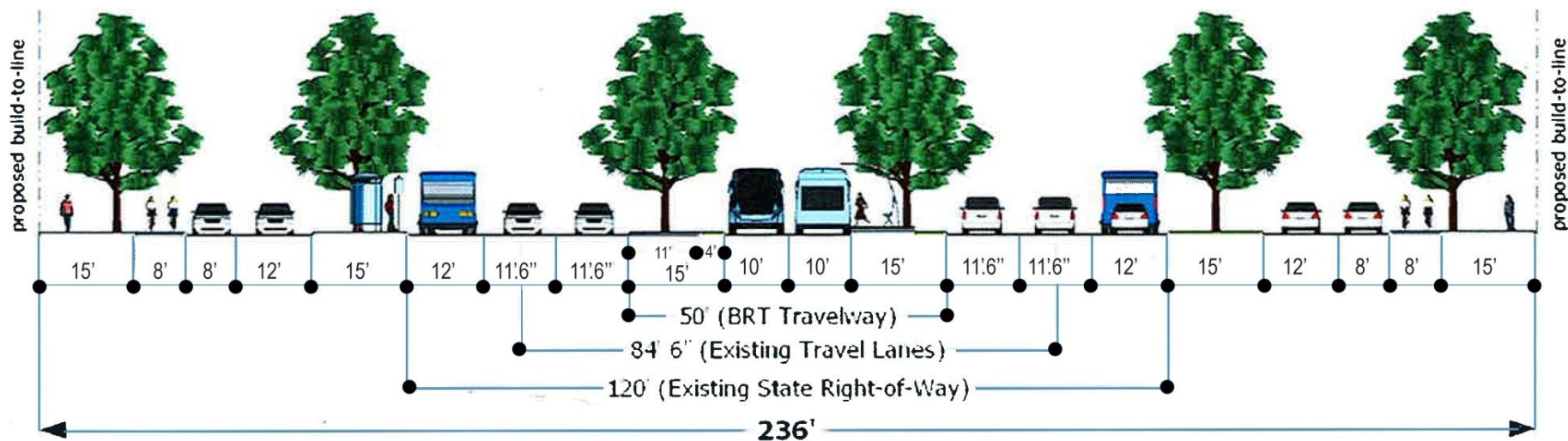


Figure B-7. Alternative cross-section along Rockville Pike—median BRT travelway

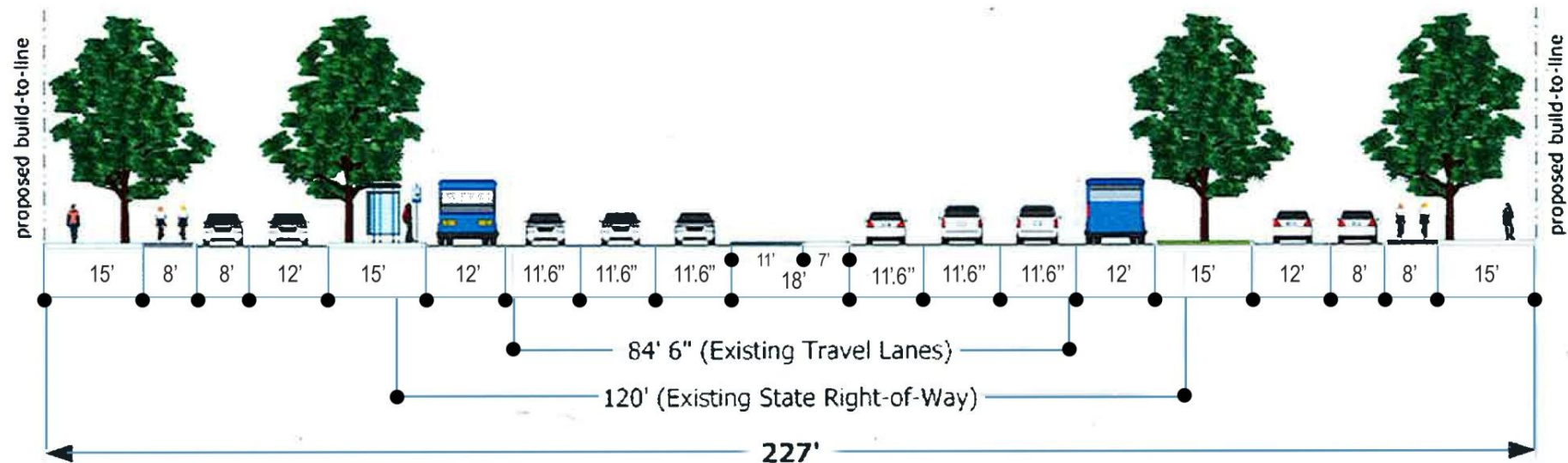


Figure B-8. Alternative cross-section along Rockville Pike—Transit vehicles in outside travel lanes

Currently, average daily traffic along MD 355 is between 31,000 and 35,000 vehicles. To alleviate the congestion experienced along this roadway, the City recommended two solutions that would affect this Functional Plan.

- ▶ Reinstate Ride On service between Travis and Montgomery Village Avenues to support alternative means of travel to the numerous employment sites along this section of the corridor. (The two proposed BRT corridors could also support this initiative.)
- ▶ Encourage the consolidation of access curb cuts along the corridor.

One of the challenges that the efforts during this Functional Plan will face during its right-of-way assessment will be along MD 355 between Montgomery Village and Summit Avenues. The existing minimum right-of-way along the corridor is 120 feet. Historic sites and commercial development built close to the roadway edge will present physical challenges to any right-of-way recommendations. Future tasks undertaken during this Functional Plan will require continued coordination with City of Gaithersburg and Maryland State Highway Administration (the agency responsible for maintaining MD 355) to identify viable recommendations for BRT operating along that corridor (for example, reconfiguring the roadway cross-section to accommodate BRT travel lanes or operating in mixed traffic with intersection priority).

Other Related Transit Projects and Planning Efforts in the County

Regional Constrained Long-range Plan (CLRP): The plan is updated annually by Washington Metropolitan Council of Governments (MWCOCG), outlines several transit projects within Montgomery County that are planned and will be federally funded. The largest of these projects are the Purple Line, a light-rail line (LRT) running between Bethesda and New Carrollton via Silver Spring and Takoma-Langley Park, and the Corridor Cities Transitway (Corridor Cities Transitway) between the Shady Grove Metrorail Station and Comsat, for which the mode has not yet been chosen (LRT or BRT). (The Master Plan also recommends an extension of the Corridor Cities Transitway from Comsat to Clarksburg, but this segment is not included in the CLRP.) In addition to the Purple Line and Corridor Cities Transitway, the CLRP also includes design and construction of the Silver Spring Transit Center (expected completion: April 2012) and Takoma/Langley Park Transit Center.



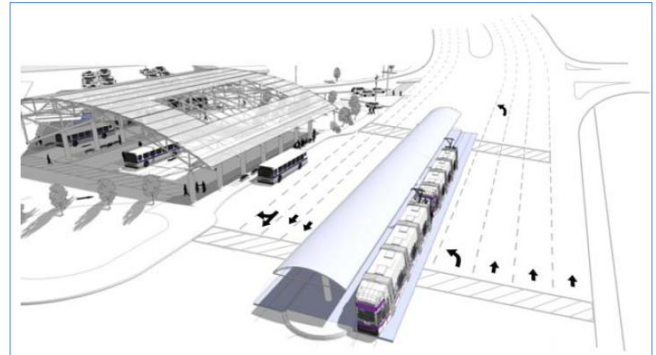
Rendering of Silver Spring Transit Center

The Silver Spring Transit Center will contain over 30 bus bays, six of which will accommodate articulated buses and could provide a station terminus for proposed BRT Corridors 4b: Georgia Avenue South and Corridor 19: US 29. It will also serve as an intermodal center connecting to MARC, taxis, intercity bus, kiss-and-ride, and a hiker/biker trail.

The Takoma/Langley Park Transit Center would be an intermodal, non-Metrorail transfer point served by Corridor 11: MD 650/New Hampshire Avenue and Corridor 18: MD 193/University Boulevard. Potential BRT operations would coordinate space for boarding and other supportive BRT facilities such as ticketing and station signing.

Regional Bus Study: This 2003 study is one of the foundational studies influencing WMATA's strategic vision for a variety of significant new services or service improvements within Montgomery County. They include the following:

- ▶ Serving high-growth areas
- ▶ Building ridership along priority corridors
- ▶ Improving cross-county and circumferential connections
- ▶ Implementing facility improvements—signal prioritization, improved modal transfers, and constructing transit centers
- ▶ Implementing new or improved services, such as RapidBus



Rendering of Takoma/Langley Park Transit Center and Purple Line Station

Many of the plan's recommended new or improved services that have been planned or implemented in the County could potentially influence of the majority of the proposed transit corridor network. As such, efforts for the Functional Plan will involve coordinating with transit planners at WMATA.

Evaluation of the Metrobus Priority Corridor Networks (PCN): The proposed transit corridor network evaluated and incorporated some of the Montgomery County-based corridors listed in WMATA's 2010 (PCN) study. The BRT corridors and corresponding PCN corridors retained from the evaluation are shown in Table B-1 and illustrated in Figure B-9.

Comparison to WMATA's Priority Corridor Network

The network recommended in this report covers most of the corridors identified in WMATA's 2010 final report, *An Evaluation of Metrobus Priority Corridor Networks*, with the exceptions being West Cedar Lane between Old Georgetown Road and Rockville Pike and East-West Highway between Bethesda and Silver Spring. Both of these corridors were considered in the feasibility study but were not carried forward as part of the 16-corridor network for the following reasons:

- ▶ The West Cedar Lane segment would have brought the Old Georgetown Road corridor along MD 355, which was already a proposed BRT corridor.
- ▶ The East-West Highway segment would compete directly with the Purple Line.

Table B-1. Comparison of PCN Corridors within Montgomery County and Affected BRT Corridors

PCN Corridor 7—University Boulevard/East-West Highway (MD-193/MD410)

Corridor 10b: MD 355 South
 Corridor 12: MD 187/Old Georgetown Road
 Corridor 18: MD 193/University Boulevard

PCN Corridor 10—Veirs Mill Road (MD-586)

Corridor 3: MD 586/Veirs Mill Road
 Corridor 4b: Georgia Avenue South
 Corridor 10a: MD 355 North

PCN Corridor 11—New Hampshire Avenue

Corridor 11: MD 650/New Hampshire Avenue

PCN Corridor 13: Georgia Avenue (MD 97)

Corridor 4a: Georgia Avenue North

PCN Corridor 14—Greenbelt-Twinbrook

Corridor 3: MD 586/Veirs Mill Road
 Corridor 14: Randolph Road
 Corridor 18: MD 193/University Boulevard

PCN Corridor 22—Colesville Road/Columbia Pike Maryland (US-29)

Corridor 19: US 29

Comparison to Councilmember Marc Elrich’s 2008 transit corridor network map

Most of the BRT corridors recommended by Councilmember Elrich in 2008 are reflected in the network recommended by this study to be retained for future evaluation. The exception is Norbeck Road from MD355 to Georgia Avenue, which was not included in the MCDOT network but which we recommend be added for study in the next phase of our work. Councilmember Elrich’s network (shown in Figure B-10) also included some optional routes of which one—Randolph Road between MD355 and Georgia Avenue—is recommended by this study to be retained for future evaluation.

Councilmember Elrich’s network did not include the two corridors recommended by this report to be deleted from further study, the ICC and Midcounty Highway.

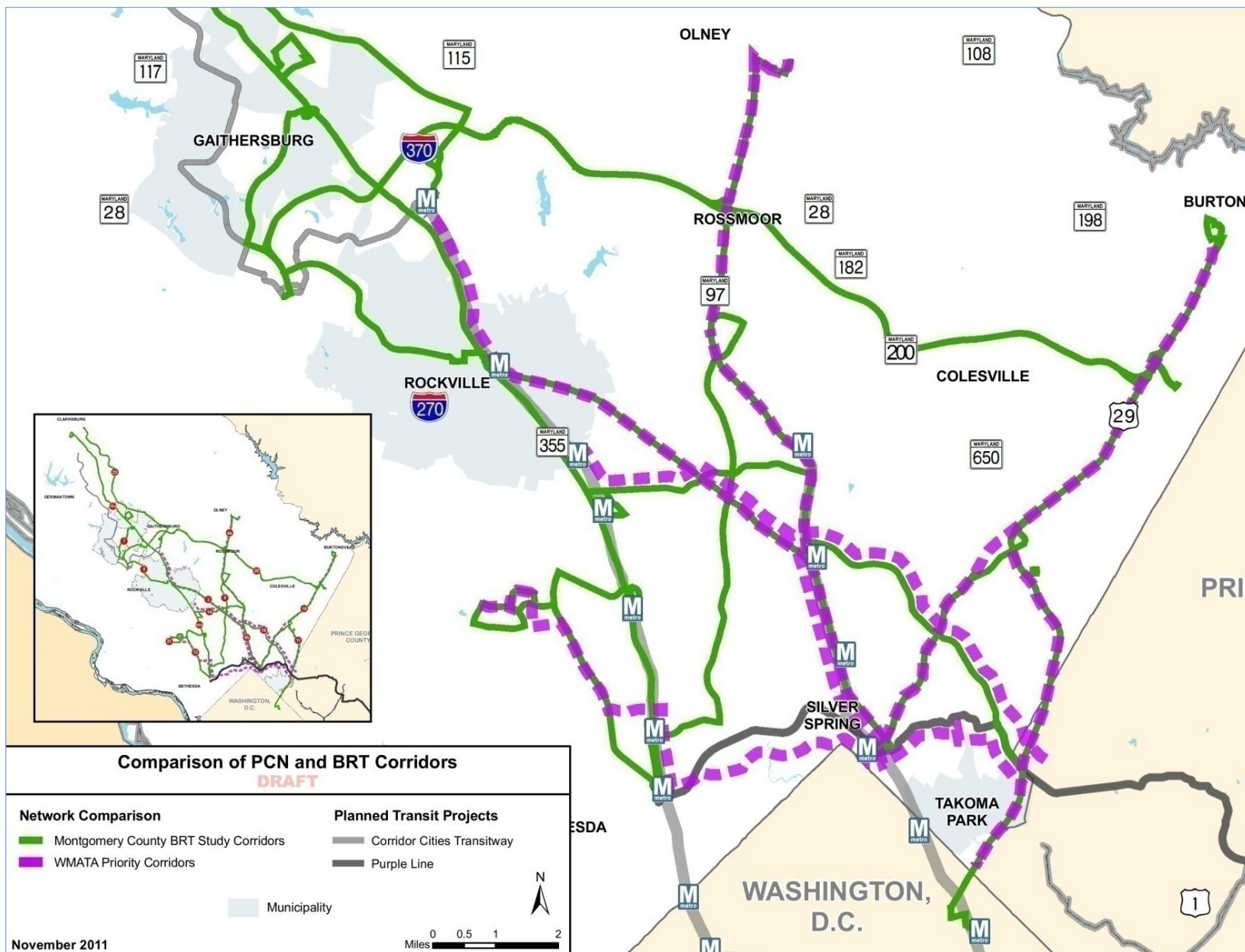


Figure B-9. Comparison of PCN and Montgomery County BRT study corridors

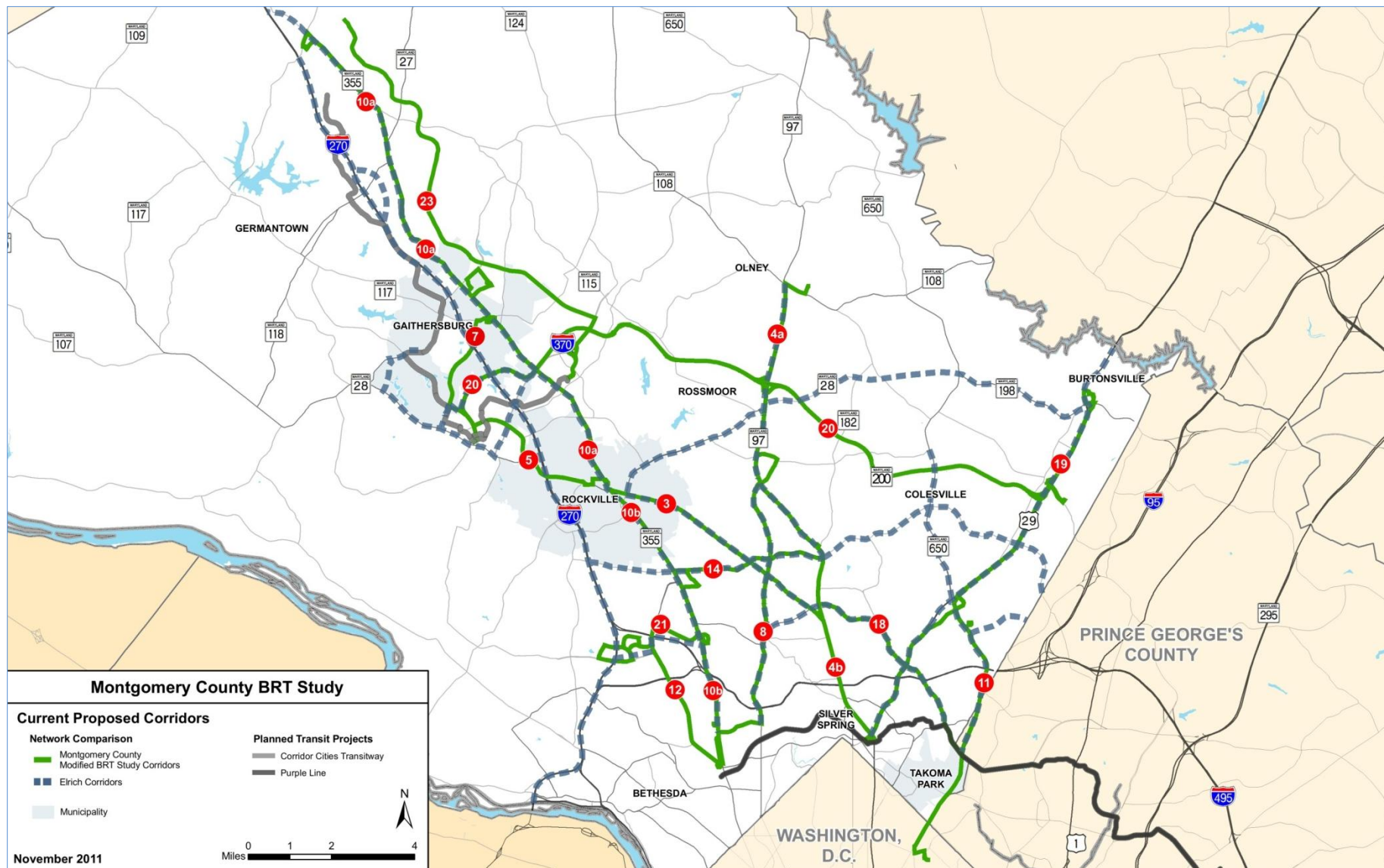


Figure B-10. Comparison of Eirich system concept and proposed transit corridor network

Wheaton Station Bus Transit & Access Needs Assessment: This 2010 study recommends the addition of two bus bays to accommodate future BRT routes operating along Georgia Avenue and Veirs Mill Road, with the assumption that the BRT vehicles exit their respective routes to enter the station facility. These recommendations will affect the following BRT corridors:

- ▶ Corridor 3: MD 586/Veirs Mill Road
- ▶ Corridor 4a: Georgia Avenue North
- ▶ Corridor 4b: Georgia Avenue South
- ▶ Corridor 18: MD 193/University Boulevard

Montgomery County Strategic Transit Plan: This 2004 Ride On plan recommends a number of service enhancements to be implemented. All corridors identified by Ride On for BRT service were incorporated into the County's feasibility study. The plan recommendations identify potential sites for transit centers (see Table B-2) and corridors that would benefit from park-and-ride lots (see Table B-3) to facilitate transfers and improve intermodal connectivity. The following tables list the potential facilities as they relate to the transit corridor network.

A 2008 update to the status of the strategic transit plan identified four locations for transit center studies or design/construction projects as part of the County's Capital Improvements Program.

- ▶ Montgomery Mall
- ▶ Montgomery Village-Lakeforest Mall
- ▶ Hillandale
- ▶ White Oak (completed as of 2010)

Future efforts by the agency will finalize other transit center locations for the County, as well as specifying locations for park-and-ride lots.

Table B-2. Potential Transit Center Locations within Montgomery County

Corridor	Intersection
Veirs Mill Road	at Connecticut Avenue
	at Randolph Road
US 29	at ICC
Georgia Avenue	at MD 108
Randolph Road	at Connecticut Avenue
Connecticut Avenue	at University Boulevard

Table B-3. Potential Corridors for Park-and-Ride Lots

Potential Corridor	Proposed Spaces
Veirs Mill Road	400-800
US 29	300-500
Georgia Avenue	200-400
Randolph Road	200-300
New Hampshire	400-700
University Boulevard	400-700

Appendix C - Recommended additions to BRT network: Letter from County Executive Leggett forwarding the Rapid Transit Task Force's recommendations to Montgomery County Planning Board



OFFICE OF THE COUNTY EXECUTIVE
ROCKVILLE, MARYLAND 20850

Isiah Leggett
County Executive

December 5, 2011

Fancoise Carrier, Chair
Montgomery County Planning Board
Maryland National Capital Park and Planning Commission
8787 Georgia Avenue
Silver Spring, MD 20910

Dear Chair Carrier: *Fancoise*

On July 29, 2011, I sent you a set of recommendations to the Master Plan of Highways that were given to me by the Montgomery County Transit Task Force. I endorsed the Task Force's recommendations as I believed they were critical to implementing a countywide rapid transit system, a system that will help the County create sustainable development, protect the environment, and help reduce traffic congestion.

As it has progressed in its work, the Task Force has identified other routes that it believes are essential to establish a high-quality transit system and that it believes need to be included in the Master Plan of Highways. As a result, it has made further recommended changes to the Master Plan of Highways. As I did in July, I endorse these recommendations and I am transmitting them to you for action.

Please see the enclosed document for the full text of the recommended amendments. Let my office know how it can be of any assistance.

Sincerely,

Isiah Leggett
County Executive

Enclosure

montgomerycountymd.gov/311



240-773-3556 TTY



MONTGOMERY COUNTY TRANSIT TASK FORCE

L. Mark Winston
Chair

November 25, 2011

The Honorable Isiah Leggett
Montgomery County Executive
Executive Office Building
101 Monroe Street, 2nd Floor
Rockville, Maryland 20850

Dear County Executive Leggett:

This is an update to the June 22, 2011 letter in which your Transit Task Force made certain recommendations related to incorporating a recommended rapid transit network into the Montgomery County Master Plan of Highways ("MPOH"). The Task Force's Work Group on Routes and Developments has performed further analysis concerning additional route segments and route phasing.

In that connection, the Transit Task Force has adopted the attached updated recommendations for your consideration. It is requested that you endorse these updated recommendations and transmit them to the Montgomery Planning Board as your own.

Very truly yours,

L. Mark Winston
Chair

**MONTGOMERY COUNTY TRANSIT TASK FORCE**

L. Mark Winston
Chair

MEMORANDUM

To: L. Mark Winston, Chair, Montgomery County Transit Task Force
Thomas Street

Cc: Members of the Transit Task Force
Adam Hafez
Justin Willets

Date: October 30, 2011

From: Tina Slater, Chair (Routes and Development Sequencing, Group "D")

Re: Updated Statement of the Working Group on Routes and Development Sequencing, per October 5, 2011 Full Task Force Meeting

**WORK GROUP D'S PRELIMINARY RECOMMENDATIONS AND RESOLUTIONS
FOR:**

- 1. THE ADDITION OF CERTAIN ROUTE SEGMENTS;**
- 2. THE EXTENSION OF CERTAIN ROUTE SEGMENTS TO THE COUNTY'S BOUNDARY LINES; and**
- 3. THE SEQUENCING (PHASING) OF ROUTE SEGMENTS**

October 5, 2011 (**updated and finalized October 30, 2011, changes noted by ****)

At its meeting on August 17, 2011, the Montgomery County Executive's Transit Task Force unanimously approved the overall plan for the ~160 mile route system that was recommended by Work Group "D" (Routes and Sequencing) to be included in Montgomery County's proposed County-wide rapid transit system.



MONTGOMERY COUNTY TRANSIT TASK FORCE

L. Mark Winston
Chair

PRACTICAL FACTORS CONSIDERED FOR SEQUENCING OF ROUTES

With the overall route system approved by the full Transit Task Force at the August 17, 2011 meeting, Work Group "D" then analyzed the following 10 engineering, construction, public policy, and other practical factors, which guided Work Group D's decisions on the most effective and efficient sequencing (phasing) of the routes:

1. Dividing the routes into phases that would be manageable for construction workloads and costs.
2. Avoiding construction of adjacent parallel roads during same time to prevent an entire traffic pattern from being taken out of service during construction.
3. Planning for adjacent alternative traffic routes and alternative transit options during construction to minimize disruption for commuters during construction.
4. Anticipating how each phase would transition to subsequent phases, so that constructing the additional route segments could be accomplished most efficiently and effectively.
5. Coordinating each phase to include segments that would provide reach to all parts of the County.
6. For the system to be most effective from the outset, the first phase must include the eastern, central, and western portions of the County, and provide at least two east-west connections (in this instance, the ICC and Randolph Road).
7. The phasing should consider the public policy objective of promoting responsible business and job growth opportunities, which could be facilitated with access to Rapid Transit Vehicles ("RTVs").
8. The phasing should consider the public policy objective of providing for and encouraging easy linkages to surrounding jurisdictions (e.g., D.C., Prince George's County, Howard County, and Frederick County).
9. The phasing should consider the public policy objective of providing RTV access to the County's multi-cultural and diverse socio-economic populations.
10. The phasing should provide RTV access for large employers, hospitals, universities, community activity centers, and public high schools (perhaps even offering the opportunity to use RTVs in lieu of school buses or students driving cars to high schools).



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TWO ADDITIONAL ROUTE SEGMENTS RECOMMENDED

After further consideration of these factors, and with the goal of maximizing opportunities for “one-seat rides” in an inter-connected RTV system, Work Group D unanimously approved a recommendation to the Transit Task Force to amend its August 17, 2011 resolution to add the following additional route segments to the proposed County-wide RTV system:

- (a) Old Georgetown Road from Tuckerman Lane north to Montrose Road/Randolph Road, which should be designed to be incorporated into the new road alignments proposed in the approved White Flint Master Plan; and
- (b) Wisconsin Avenue from Bethesda Metro Station to Friendship Heights Metro Station.

Presuming the Transit Task Force approves this amendment, the Transit Task Force should recommend to the County Executive that he recommend to the County Council and Planning Board (as applicable) the inclusion of these two additional route segments into the County’s Master Plan of Highways and Transitways, as an additional part of the County-wide RTV system.

EXTENSIONS OF CERTAIN ROUTE SEGMENTS TO THE COUNTY’S BOUNDARY LINES

Work Group D also recommends that the set of routes and sequencing be further revised, depending upon the future coordination and integration with surrounding jurisdictions. If Howard County, Prince George’s County, the District of Columbia, and/or Frederick County were willing to integrate and coordinate compatible rapid transit systems, then Work Group D recommends the following set of route segments within Montgomery County be added to extend the RTV system to the County boundary line, as applicable:

- Route 29 from Burtonsville north to Howard County line;
- Cherry Hill Road from FDA Boulevard east to Prince George’s County line;
- Georgia Avenue from Silver Spring Transit Center south to District of Columbia line;
- Wisconsin Avenue from Friendship Heights south to District of Columbia line; and
- Route 355 from Clarksburg/CCT north to Frederick County line



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In addition, if the U.S. Department of Transportation were willing to permit an integrated, coordinated, and compatible rapid transit system with Northern Virginia and Frederick County via the interstates, then Work Group D's recommended set of route segments within Montgomery County should also include connections to the Capital Beltway and I-270 (e.g., Montgomery Mall to I-270 to American Legion Bridge).

Presuming the Transit Task Force adopts these recommendations, the Transit Task Force should recommend to the County Executive that he recommend to the County Council and Planning Board (as applicable) the inclusion of these route segment extensions (to the County boundary lines) into the County's Master Plan of Highways and Transitways, which would allow for integration and coordination of the RTV system with surrounding jurisdictions.

RECOMMENDED SEQUENCING (PHASING) OF ROUTES

Based upon the 10 practical considerations described above, and with the addition of the supplemental route segments described above, Work Group "D" *unanimously* approved the preliminary set of phasing recommendations, as set forth in the appended pages and maps identifying the proposed Phase One, Phase Two, and Phase Three sequencing.

Please note that these recommendations are preliminary in nature, recognizing that the final phasing of these route segments may have to be refined after careful analysis of the following factors (much of which could be accomplished with a 10% design and engineering study):

1. Engineering analysis of existing physical constraints, rights-of-way needed, and utility relocation required.
2. Determination of how needed rights-of-way can be acquired (and how long that process might be).
3. Consideration of construction disruption issues (such as the availability of alternative traffic patterns during construction).

Completion of full engineering, construction, and scheduling analyses may also result in a final determination that route segments suggested in any given phase may have to be divided into sub-phases, where only a portion of that route is built initially and the balance of that route is built at a later time. For example, it may be that right-of-way acquisition requirements (and/or coordination with the City of Gaithersburg and City of Rockville) might result in only portions of Route 355 being built initially (or perhaps without the "gold standard" RTV attributes), with the other portions of Route 355 being built at a later time. While these factors may require



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portions of route segments to be sub-phased, the route segments as a whole are recommended to be phased generally as set forth in the appended pages and maps.

In addition to these engineering and other construction practicalities, each route segment would have to be evaluated to determine what level of potential RTV service would apply at the time the route (or particular segment of that route) is initially built. For example, a particular route segment may have relatively low ridership as of the time that segment is recommended to be built; but may experience a significant increase in ridership once that route segment becomes incorporated into the County-wide RTV system (e.g., Norbeck Road between Veirs Mill Road and ICC). In this instance, that route segment may be constructed to start out as merely enhanced bus service on a dedicated lane, but without all of the “gold standard” designs and attributes that would be the trademark of the County-wide RTV system. But the expectation would be that ultimately ridership would grow --- perhaps rapidly and exponentially, as that route becomes integrated into a comprehensive RTV system that establishes a “critical mass” of ridership --- which, in turn, would justify making additional investments to elevate that route segment’s attributes from mere enhanced bus service to the “gold standard” RTV system. From a branding standpoint, it would be important in this case NOT to consider the route part of the County’s RTV system at its initial stage of mere enhanced bus service; but instead, as part of an inter-connected multi-modal system that is distinguishable from the fully graduated “gold standard” RTV system. Only when a route has all the signature designs and attributes of the “gold standard” RTV system would that route be considered as having “graduated” to the RTV system, so as not to dilute the value of our unique RTV brand.

RECOMMENDED RESOLUTIONS FOR THE TRANSIT TASK FORCE

With these considerations and with these caveats, Work Group “D” recommends the Transit Task Force adopt the following resolutions:

RESOLVED, that the Transit Task Force approves an amendment to its August 17, 2011 resolution to add the following additional route segments to the proposed County-wide rapid transit system:

- (a) Old Georgetown Road from Tuckerman Lane north to Montrose Road/Randolph Road, which should be designed to be incorporated into the new road alignments proposed in the approved White Flint Master Plan; and**
- (b) Wisconsin Avenue from Bethesda Metro Station to Friendship Heights Metro Station.**



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FURTHER RESOLVED, that the Transit Task Force approves a further amendment to its August 17, 2011 resolution to allow for the following extensions of route segments to the County boundary lines, so that the County's proposed RTV system could be coordinated and integrated with surrounding jurisdictions, as applicable:

- (a) Route 29 from Burtonville north to Howard County line;
- (b) Cherry Hill Road from FDA Boulevard east to Prince George's County line;
- (c) Georgia Avenue from Silver Spring Transit Center south to District of Columbia line;
- (d) Wisconsin Avenue from Friendship Heights south to District of Columbia line;
- (e) Route 355 from Clarksburg/CCT north to Frederick County line; and
- (f) To I-495 and/or I-270, as necessary and appropriate.

FURTHER RESOLVED, that the Transit Task Force authorizes and approves transmitting these amendments to the County Executive, together with the Transit Task Force's recommendation that the County Executive recommend to the County Council and the Planning Board (as appropriate) including the additional route segments as described in these amendments into the County's Master Plan of Highways and Transitways, thereby providing necessary reservations of rights-of-way and plans for the Transit Task Force's proposed County-wide RTV system.

FURTHER RESOLVED, that the Transit Task Force approves and recommends to the County Executive the specific phasing and sequencing of route segments as more fully set forth in the appended pages and maps.

After analysis and discussion by the Transit Task Force at its meeting held on October 5, 2011, the Transit Task Force adopted the reasoning and intent of Work Group D's Preliminary Recommendations described above, and the Transit Task Force adopted the Resolutions set forth above by a vote of 14 in favor, 0 opposed, and 1 abstaining (Casey Anderson).**

The following Task Force Members were in attendance: Casey Anderson, Marilyn Balcombe, Nat Bottigheimer, Marc Elrich, Jonathan Genn, David Hauck, Art Holmes, David McDonough, Wayne Phyllaier, Rich Parsons, Craig Simoneau, Tina Slater, Francine Waters, Dan Wilhelm, Mark Winston, and Diane Ratcliff representing Darrell Mobley.

The following Task Force Members were absent: Roger Berliner, Françoise Carrier, Henry Montes, and Jonathan Sachs.



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PRELIMINARY RECOMMENDED ROUTE SEGMENT SEQUENCING

PHASE ONE

(These routes are not listed in any presumed order of priority; but instead, listed simply according to length of segment. All routes identified for Phase One are presumed to be built out simultaneously to the maximum practical extent, factoring in: availability of alternative travel routes during construction phases, availability of transit alternatives during construction phases, possible disruption of traffic patterns during construction, the efficient deployment of construction crews and machinery, and other construction practicalities.)

<u>Route Segment</u>	<u>Estimated Length</u>
ICC (I-270 to 29/Colesville Road)**	22.9 miles**
RANDOLPH ROAD (355/Rockville Pike to FDA Boulevard)	12.5 miles
355/ROCKVILLE PIKE (Mont Village Ave to Bethesda Metro Station)	12.1 miles
ROUTE 29/COLESVILLE ROAD (Burtonsville/198 to Silver Spring Metro)	10.7 miles
GEORGIA AVENUE (North) (Olney to Veirs Mill Road)	9.8 miles
VEIRS MILL ROAD (Rockville/County Office Buildings/Metro to Wheaton Metro Station/Georgia Ave)	6.7 miles
TOTAL MILES IN PHASE ONE:	~74.7 miles¹

¹ This Phase One listing presumes the CCT is built as light rail and not as part of RTV system. If, however, the CCT were to be built as part of the RTV system, then the Transit Task Force



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(~51.8 "new construction" miles in Phase One, if ICC = "RTV ready")**

PRELIMINARY RECOMMENDED ROUTE SEGMENT SEQUENCING

PHASE TWO

(These routes are not listed in any presumed order of priority; but instead, listed simply according to length of segment. All routes identified for Phase Two are presumed to be built out simultaneously to the maximum practical extent, factoring in: availability of alternative travel routes during construction phases, availability of transit alternatives during construction phases, possible disruption of traffic patterns during construction, the efficient deployment of construction crews and machinery, and other construction practicalities.)

<u>Route Segment</u>	<u>Estimated Length</u>
NEW HAMPSHIRE AVENUE (ICC to Fort Totten*)	10.1 miles
CONNECTICUT AVENUE (Georgia Avenue/Aspen Hill to Purple Line and spur on Jones Bridge Road to Rockville Pike/Medical Center)	7.6 miles
UNIVERSITY BOULEVARD (Georgia Ave to New Hampshire Ave/Purple Line)	6.4 miles
OLD GEORGETOWN ROAD (Montrose Parkway/Randolph Road to Bethesda Metro/Wisconsin Avenue)	5.8 miles
ROUTE 28 TO ICC (From Veirs Mill Road to ICC)	5.5 miles
ROCKVILLE TOWN CENTER TO LSC (Route 28/Monroe St/County Offices/Metro to Life Sciences Center/CCT connection)	5.3 miles

recommends the CCT segment be built as part of this Phase One, which would add an additional ~15.0 miles to the Phase One system (making the total miles in Phase One ~89.7 miles).



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**NORTH BETHESDA TRANSITWAY/
DEMOCRACY BOULEVARD**

(355/Rockville Pike to Tuckerman to
Democracy Blvd/Montgomery Mall)

5.1 miles

TOTAL MILES IN PHASE TWO: ~45.8 miles

*Approximately 5.3 miles of this segment, south of Elton Road/Beltway, presumes coordination with Prince George's County and the District of Columbia.

PRELIMINARY RECOMMENDED ROUTE SEGMENT SEQUENCING

PHASE THREE (All Remaining Segments After Phase Two)

(These routes are not listed in any presumed order of priority; but instead, listed simply according to length of segment. All routes identified for Phase Three are presumed to be built out simultaneously to the maximum practical extent, factoring in: availability of alternative travel routes during construction phases, availability of transit alternatives during construction phases, possible disruption of traffic patterns during construction, the efficient deployment of construction crews and machinery, and other construction practicalities.)

<u>Route Segment</u>	<u>Estimated Length</u>
355/ROCKVILLE PIKE (Montgomery Village Avenue to Clarksburg/CCT, including the Spur at Middlebrook Road via Observation Drive and Montgomery College-Germantown)	14.9 miles
MID COUNTY CONNECTOR (Clarksburg/MD 27 to ICC)**	13.4 miles
LAKEFOREST MALL/MUDDY BRANCH RD (CCT to Gaithersburg)	7.2 miles
GEORGIA AVENUE (South) (Veirs Mill Road to Silver Spring Transit Center)	3.9 miles
WISCONSIN AVENUE (Bethesda Metro to Friendship Heights Metro)	1.6 miles



MONTGOMERY COUNTY TRANSIT TASK FORCE

L. Mark Winston
*Chair***NORTHWEST CONNECTOR**
(Between CCT and 355 - TBD)

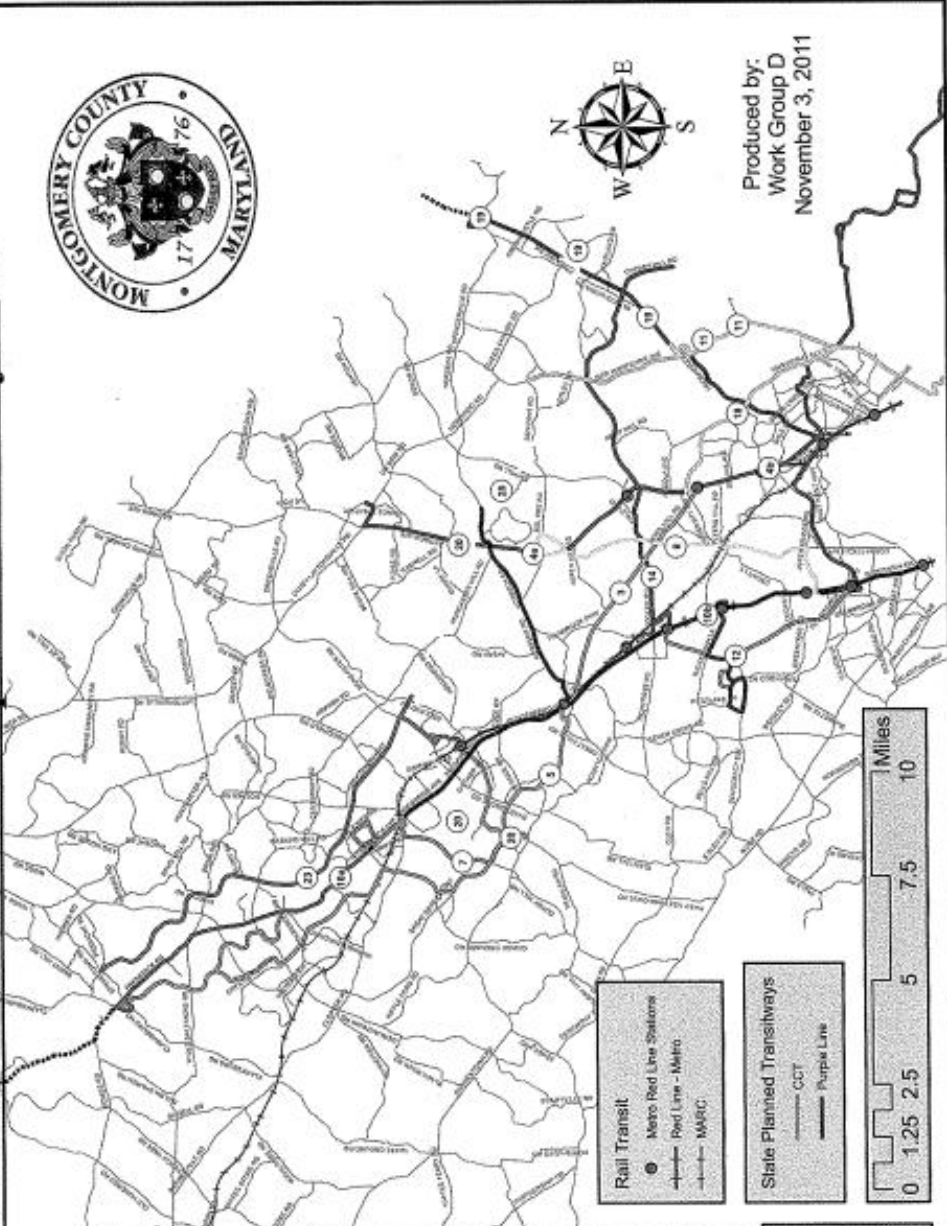
1.0 miles

TOTAL MILES IN PHASE THREE:**~42.0 miles*****TOTAL MILES OF ALL PHASES:******~162.5 miles****(Total of ~139.6 "new construction" miles if ICC = "RTV Ready")***
(Total of ~177.5 miles if CCT were RTV)

Transit Task Force Full Rapid Transit System



Produced by:
Work Group D
November 3, 2011

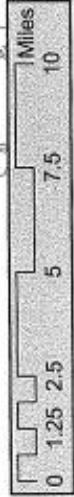


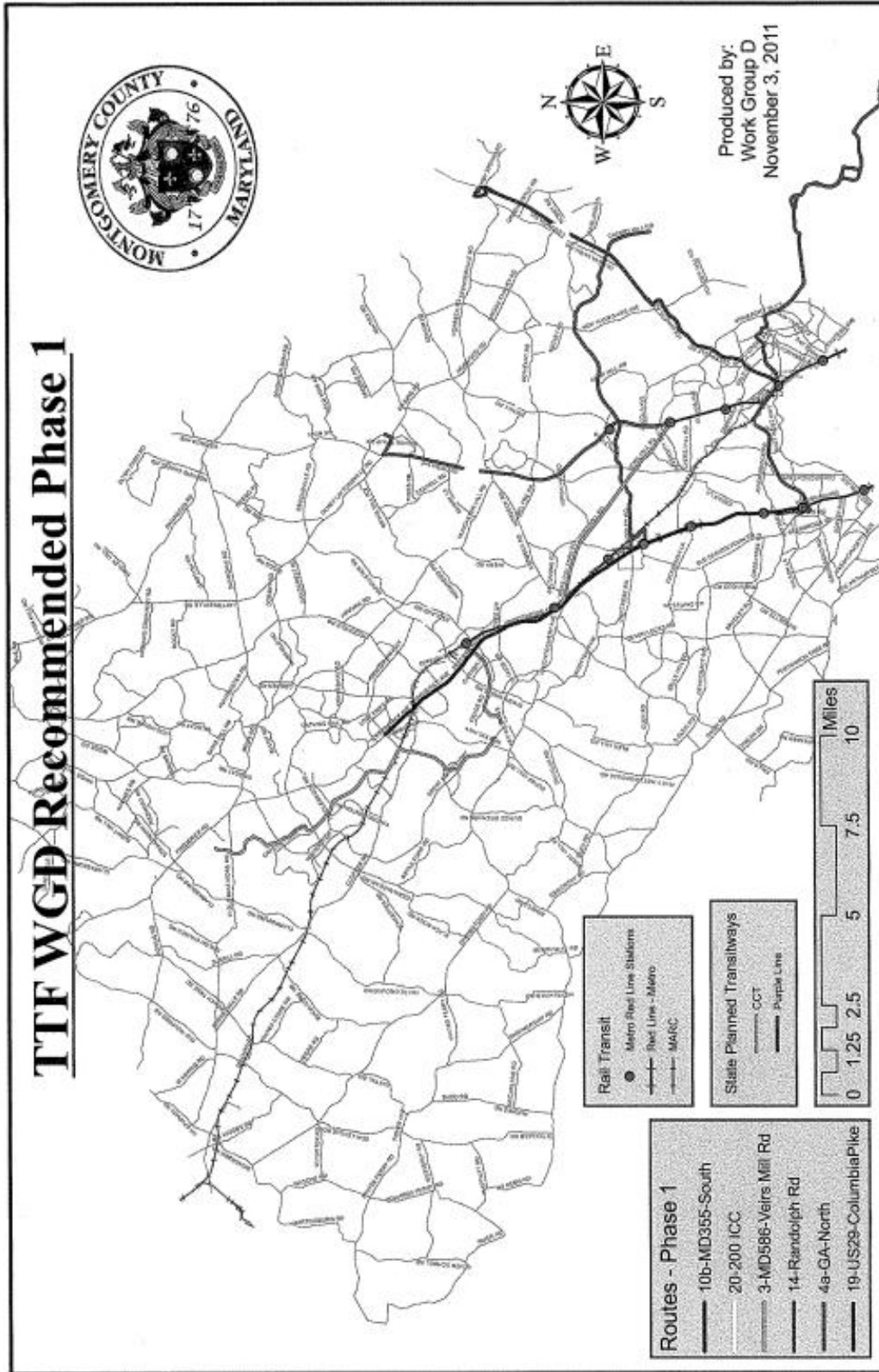
- RTV System**
- 3-MD386-Vears Mill Rd
 - 4a-GA-North
 - 4b-GA-South
 - 5-Gude Drive-Key West Avenue
 - 7-MD124-Muddy Branch
 - 8-MD185-Connecticut Avenue
 - 10a-MD355-North
 - 10b-MD355-South
 - 11-MD650-New Hampshire
 - 12-Old Georgetown Road
 - 14-Randolph Rd
 - 18-MD193-University Blvd
 - 19-US29-ColumbiaPike
 - 20-200 ICC
 - 23-North Bethesda Transitway
 - SR28-Norbeck Road
 - M83-Mid County Highway

- County Line Extensions**
- 4a-Silver Spring to DC Line
 - 10a-Clarksburg to Frederick County
 - 18-US29 - Burtonsville to Howard County
 - FD0A Blvd to Prince George's County

- Rail Transit**
- Metro Red Line Stations
 - Red Line - Metro
 - MARC

- State Planned Transitways**
- CCT
 - Purple Line

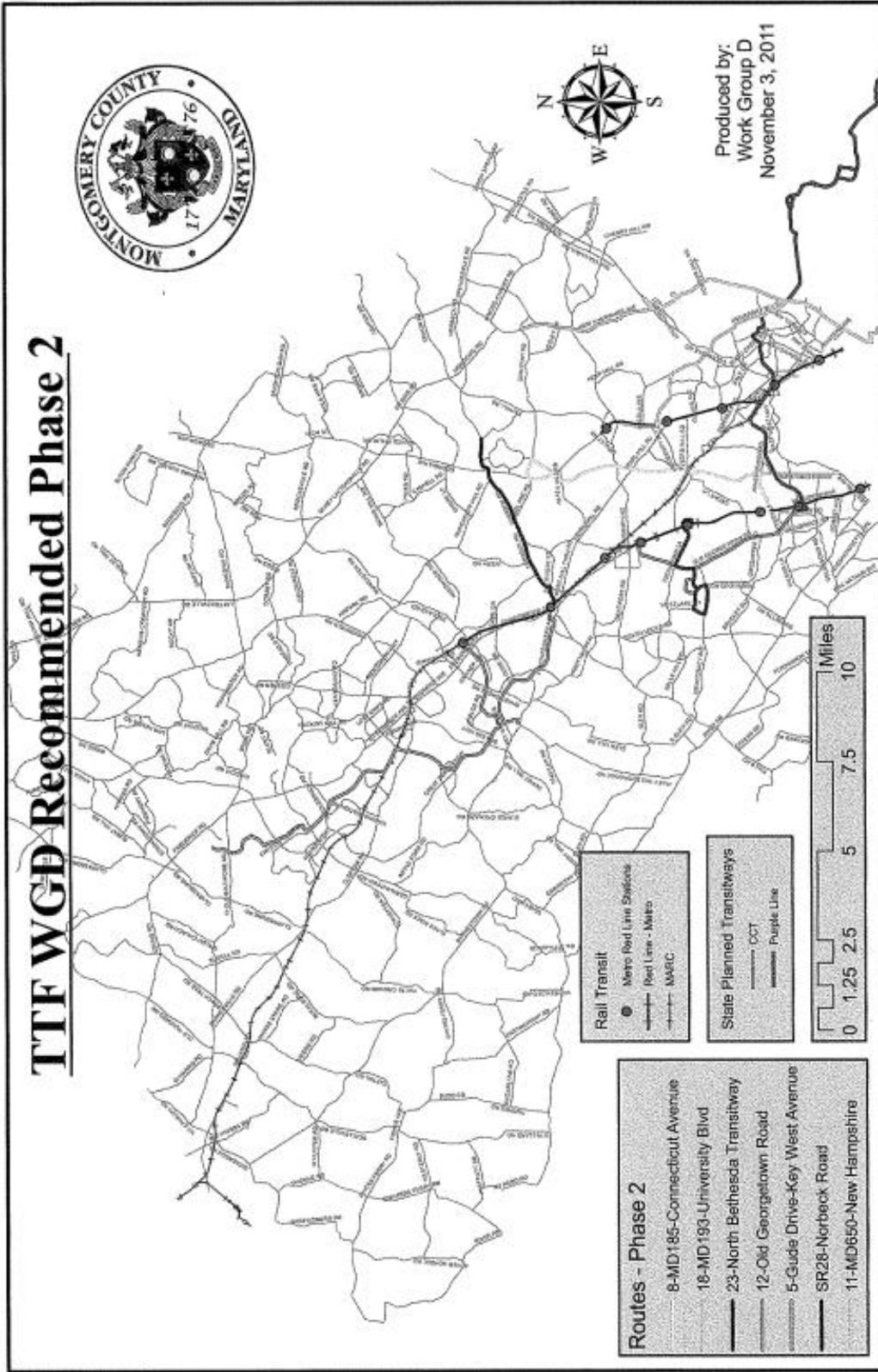


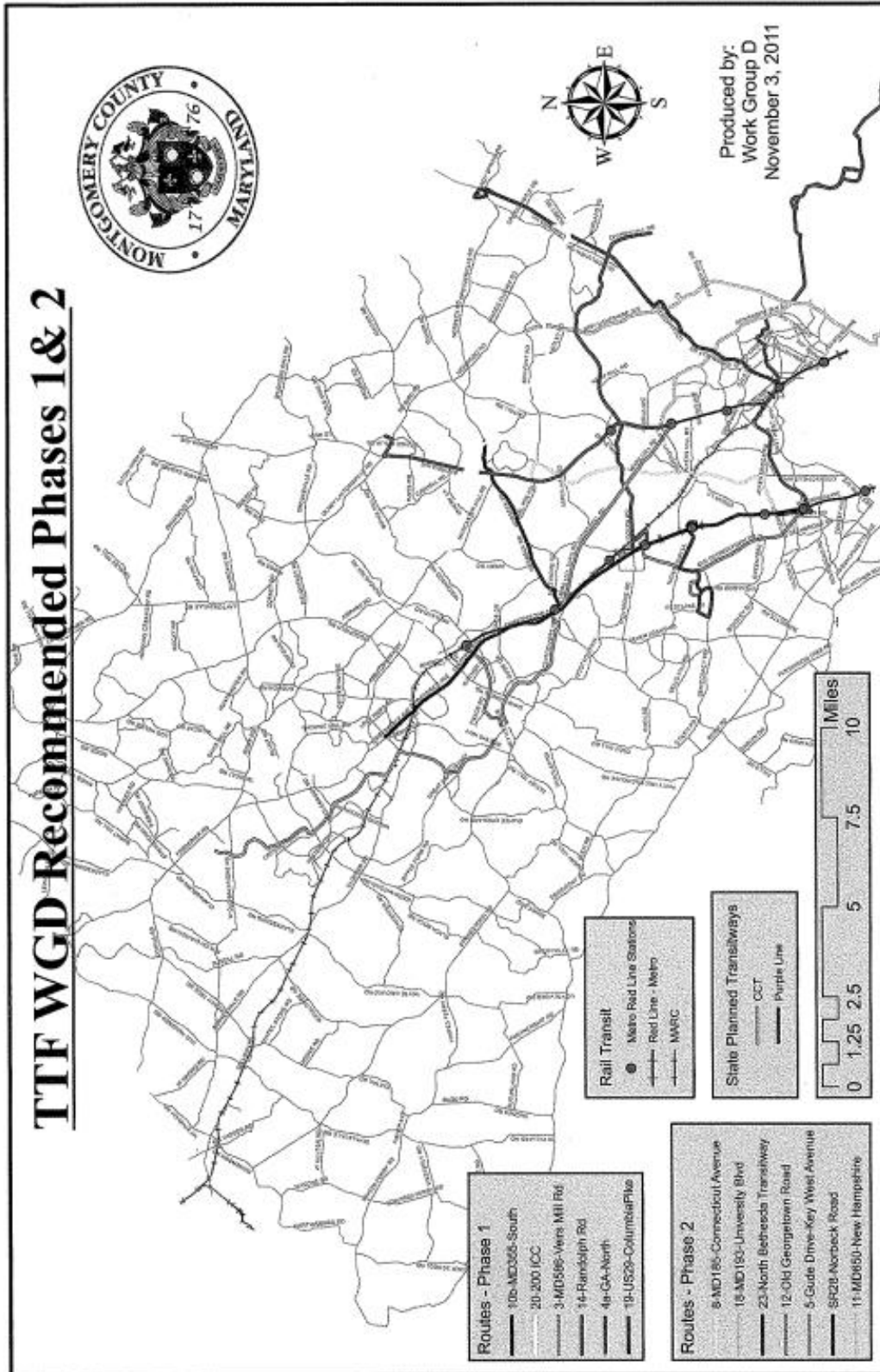


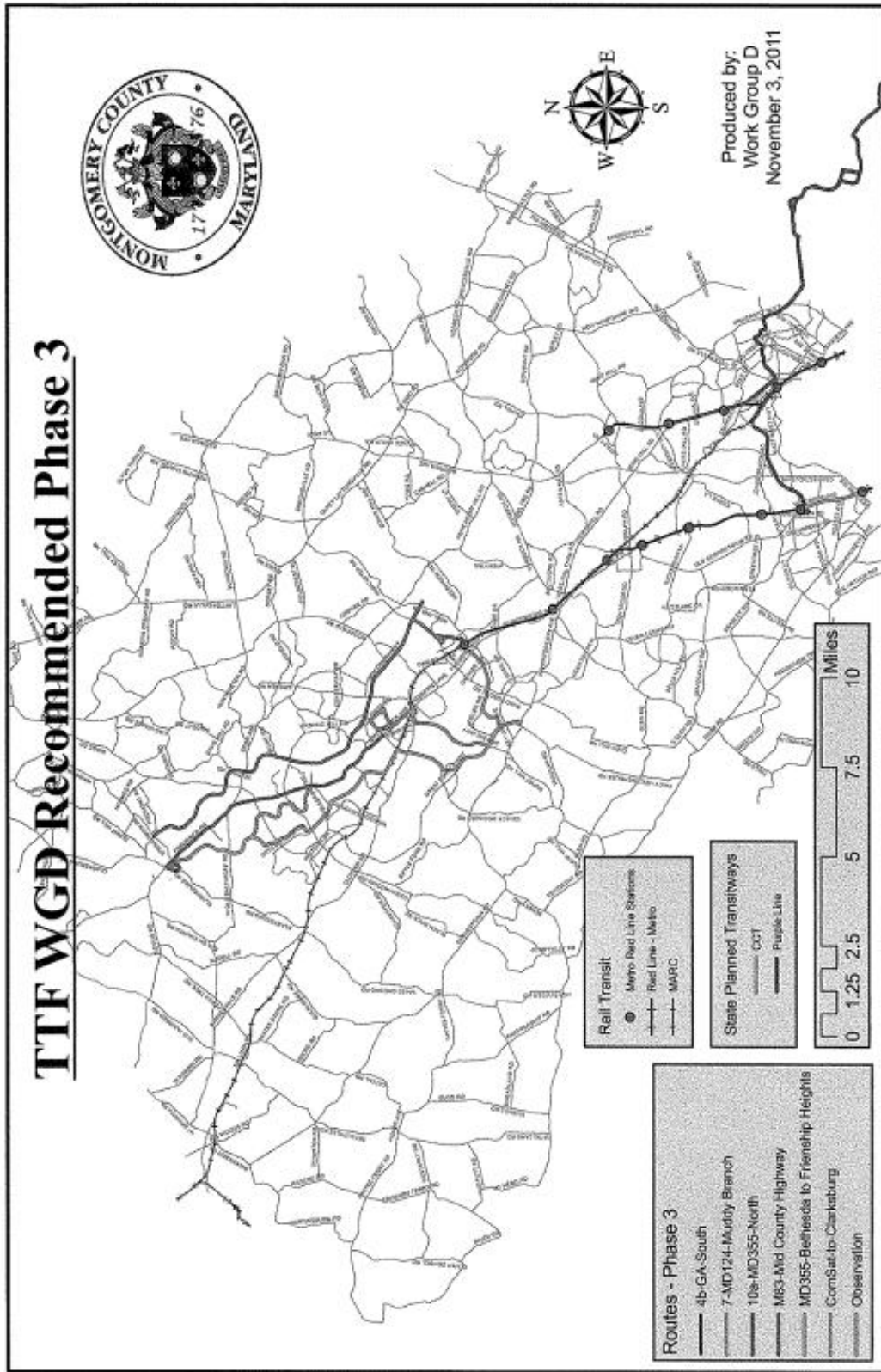
TTF WGD Recommended Phase 2

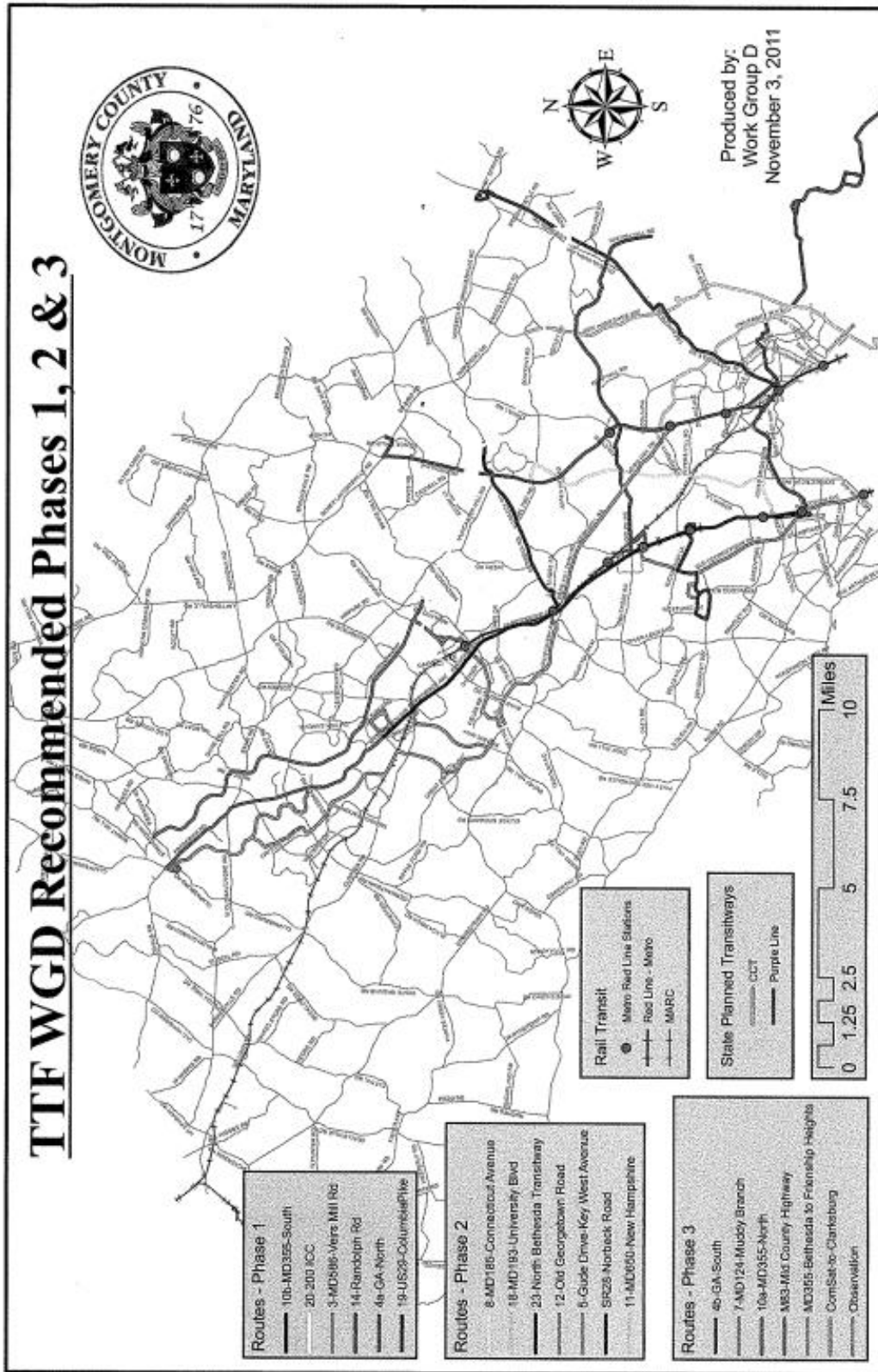


Produced by:
Work Group D
November 3, 2011









Appendix D—Detailed description of initial corridor and station analyses

Corridor functions

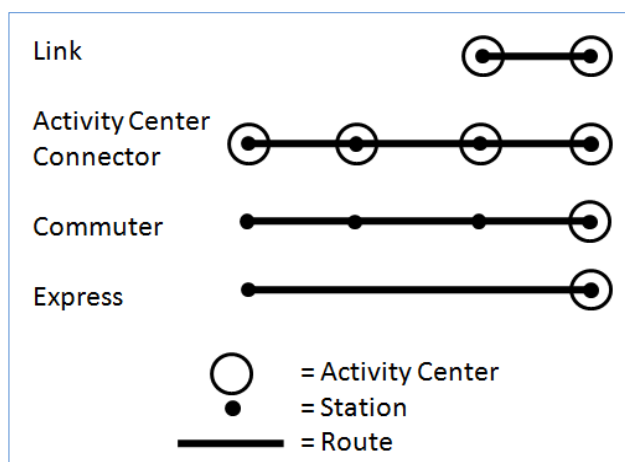
Three key types of corridor functions were defined that summarize the types of trips expected along proposed BRT corridors and identify the facilities needed to support specific corridor types. The corridor function types will aid discussions of the degree of right-of-way investment necessary relative to ridership potential, given specific land-use types and roadway classifications within each potential BRT corridor.

The key attributes of these corridor types are summarized as follows:

Commuter/Express*

- ▶ High ridership directed toward CBD or transfer to regional transit service, typically located at terminus
- ▶ Typically implemented along freeways, highways, or arterials
- ▶ Low to moderate percentage of corridor meets BRT-supportive population or employment densities

*Stations along an express corridor are generally separated by several miles, as compared to a commuter corridor.



Activity center connector

- ▶ High ridership distributed among multiple activity centers located throughout corridor and at termini
- ▶ Typically implemented along major highways, or major or minor arterials
- ▶ Moderate to high percentage of corridor meets BRT-supportive population or employment densities

Link

- ▶ High ridership distributed between activity centers located at termini
- ▶ Typically implemented along major or minor arterials
- ▶ Moderate percentage of corridor meets BRT-supportive population or employment densities

Figure D-1 illustrates the data used to assess a corridor's particular function. The corridor function types will aid discussions of the degree of right-of-way investment needed in the County relative to ridership potential, given specific land-use types, and roadway classifications within each potential BRT corridor. The initial analysis shows that some corridor types are more conducive to the needs for additional parking; however, this will be the consideration of future studies related to BRT development in Montgomery County.

Table D-1 summarizes the corridor function types for each proposed BRT corridor, as well as recommended supporting facilities. As shown, some corridor types are more conducive to the needs for additional parking; however, the identification of parking needs that could enhance transit service will be the consideration of future studies related to BRT development in Montgomery County.

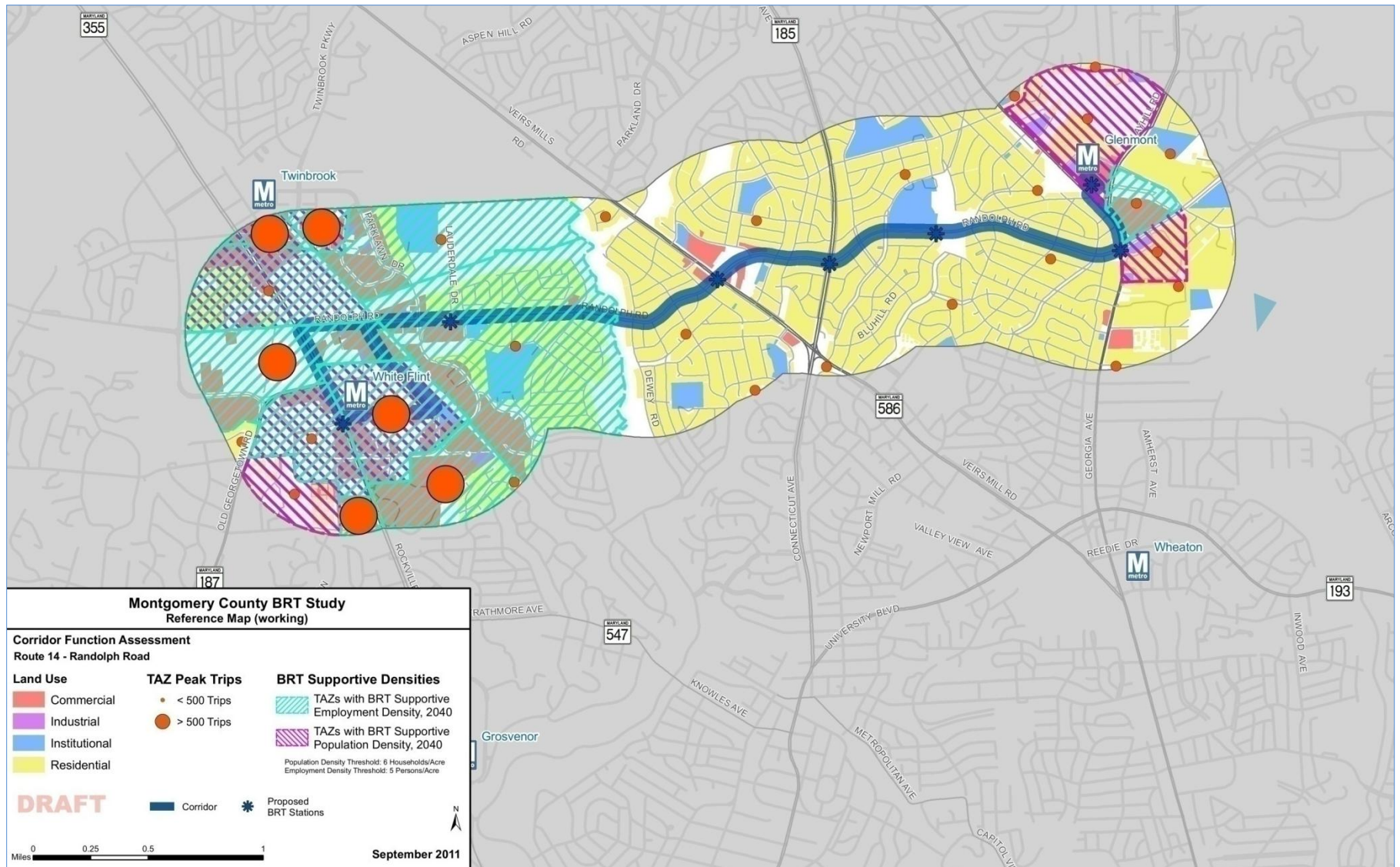


Figure D-1. Illustrative Assessment of Commuter Corridor

Table D-1. Summary of BRT Corridor Functions and Supportive Facilities

Corridor	Typology	Proposed Supportive Facility	Corridor	Typology	Proposed Supportive Facility
3: Veirs Mill Road	Commuter	<ul style="list-style-type: none"> • Shared Parking lots • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access 	11: MD 650/New Hampshire Avenue	Commuter	<ul style="list-style-type: none"> • Shared Parking lots • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access
4a: Georgia Avenue North	Commuter	<ul style="list-style-type: none"> • Shared Parking lots • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access 	12: Montgomery Mall/Old Georgetown Road	Activity Center Connector	<ul style="list-style-type: none"> • Increased bicycle access • Bicycle storage • Increase pedestrian access
4b: Georgia Avenue South	Commuter	<ul style="list-style-type: none"> • Shared Parking lots • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access 	14: Randolph Road	Commuter	<ul style="list-style-type: none"> • Shared Parking lots • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access
5: Rockville-LSC (formerly Rockville Loop)	Link	<ul style="list-style-type: none"> • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access 	18: MD 193/University Boulevard	Activity Center Connector	<ul style="list-style-type: none"> • Shared Parking lots • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access
7: MD 124/Muddy Branch Road	Link	<ul style="list-style-type: none"> • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access 	19: US 29	Commuter	<ul style="list-style-type: none"> • Park-and-ride lots • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access
8: Connecticut Avenue	Commuter	<ul style="list-style-type: none"> • Shared Parking lots • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access 	20: ICC	Express	<ul style="list-style-type: none"> • Park-and-ride lots • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access
10a: MD 355 North	Activity Center Connector	<ul style="list-style-type: none"> • Increased bicycle access • Bicycle storage • Increase pedestrian access 	21: North Bethesda Transitway	Link	<ul style="list-style-type: none"> • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access
10b: MD 355 South	Activity Center Connector	<ul style="list-style-type: none"> • Increased bicycle access • Bicycle storage • Increase pedestrian access 	23: Midcounty Highway	Commuter	<ul style="list-style-type: none"> • Park-and-ride lots • Feeder bus bays • Increased bicycle access • Bicycle storage • Increase pedestrian access

Station types, locations, and access

Station types will be assigned to each of the proposed BRT station in the network. The classification process will aid in identifying the following:

- ▶ The basic function of land uses surrounding a station
- ▶ The means by which to access a station and the need for parking and bus transfer facilities to serve a station
- ▶ Locating stations off-street or on-street
- ▶ If stations are on-street, their relationship to the median or curb and placement along the street (pending the particular BRT alignment and operation)
- ▶ The level of passenger amenities and degree of shelter to be provided, given the estimated ridership patterns at a station

Table D-2 outlines six typologies that were defined for classifying stations within the proposed transit corridor network. These typologies identify the basic attributes at the different BRT station areas, as related to the surrounding types of land uses. Examples of some of the station typologies are found in Figures D-2 and D-3.

Further work will include applying the station typologies to the station locations identified in the feasibility study. The work will also assess the level of station access (by auto, bicycle, walking, or other transit modes) and specific station locations (on- or off-street; near-side, far-side, or midblock) to determine the proposed station footprint and thus necessary right-of-way for BRT stations.

Table D-2. Attributes of BRT station typologies

Station Typologies
<i>Transit Center</i>
<ul style="list-style-type: none"> • Provides major transfer opportunities to other transit modes • Kiss-and-ride, bicycle storage, some park-and-ride • Variety of surrounding land-use types and densities • Potential to share boarding facilities with existing transit at station
<i>Central Business District (CBD)</i>
<ul style="list-style-type: none"> • Typically on-street station directly adjacent to CBD development • Focus on pedestrian access; provide exclusive bicycle facilities as possible • Station shelters could be integrated with adjacent buildings
<i>Park-and-Ride Lot</i>
<ul style="list-style-type: none"> • At park-and-ride facility, typically at terminus • Surrounding land use densities typically lower than in other areas • Passenger amenities relative to number of parking spaces and level of transit service • Typically limited bicycle/pedestrian connections between surrounding area
<i>High-Density Residential</i>
<ul style="list-style-type: none"> • One or multiple apartment/condo residential complexes • Typically surrounded by lower-density single-family housing • Good pedestrian access, given level of sidewalk development; bicycle facilities could focus on major access roadways • Greater shelter provision
<i>Major Activity Center</i>
<ul style="list-style-type: none"> • Within single- or mixed-use activity center outside of CBD, with transit-supportive density • Pedestrian/bicycle connections (direct or circuitous) dependent on form and location of development • On- or off-street stations with sizable shelters
<i>Low-Density Residential</i>
<ul style="list-style-type: none"> • Typically on-street station serving low-density residences • Smaller station amenities due to likelihood of lower ridership • Pedestrian/bicycle connections (direct or circuitous) dependent on form and location of development

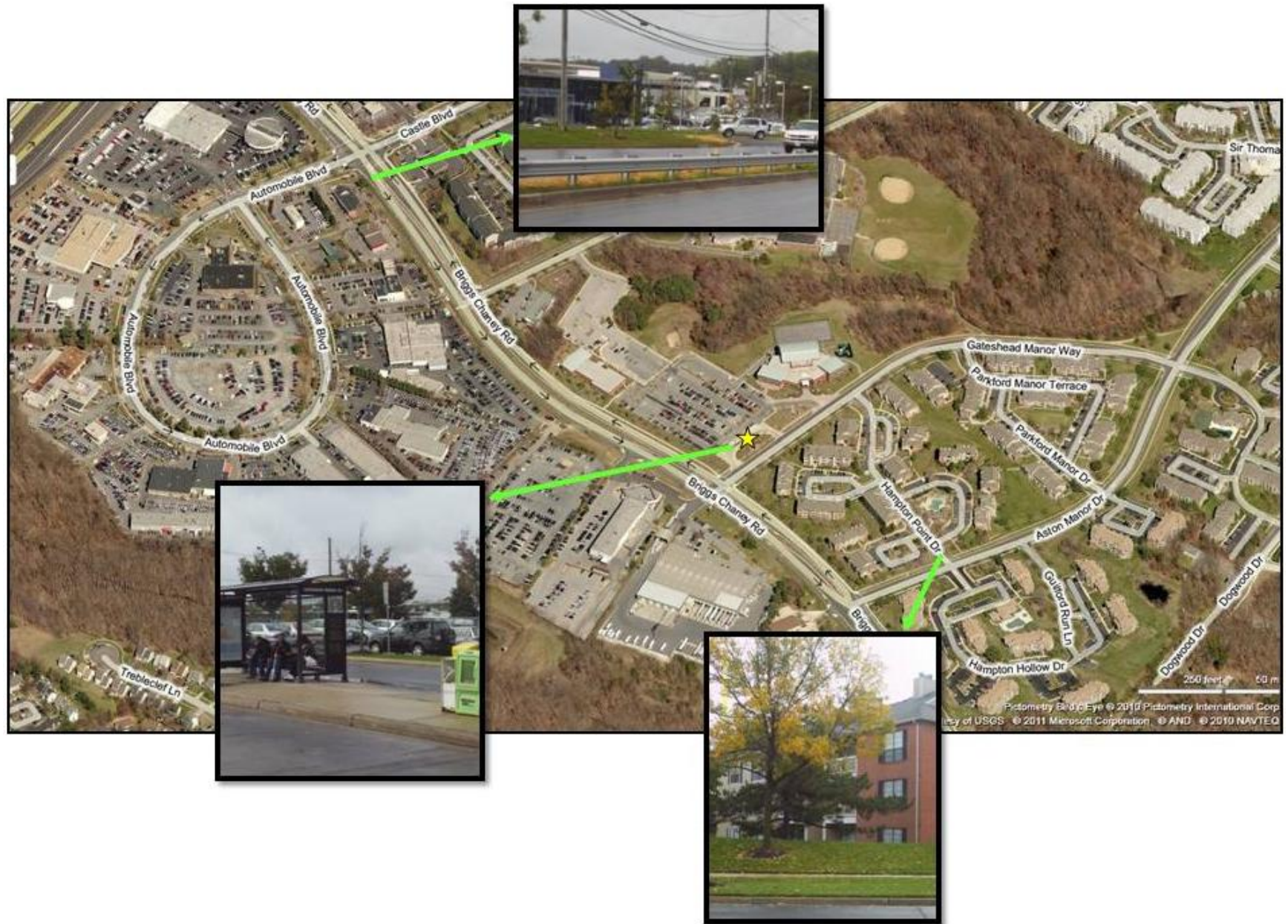


Figure D-2. Example of station typology—Park-and Ride Lot (Briggs Chaney)

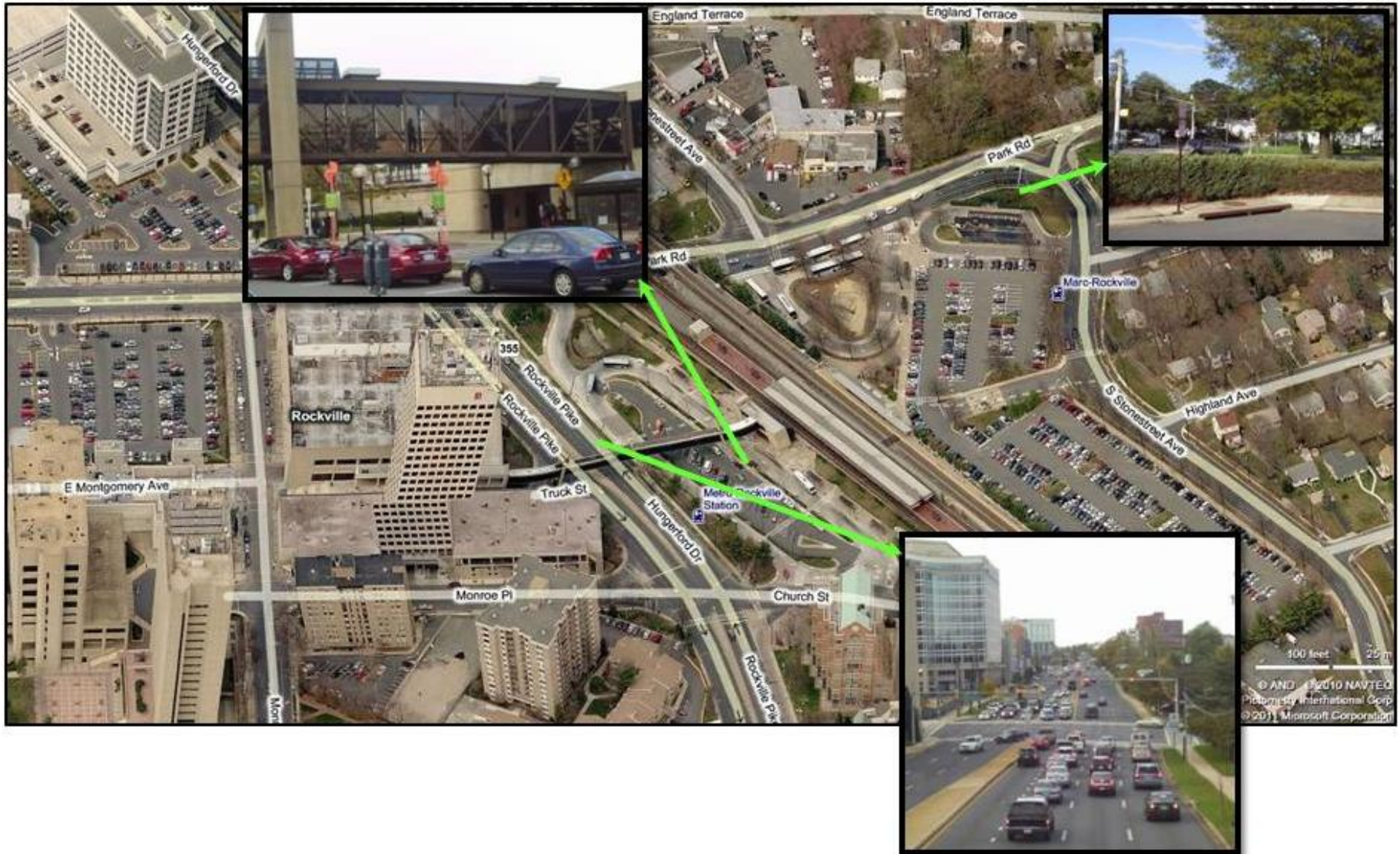


Figure D-3. Example of station typology—Transit Center (Rockville Metrorail Station)

Appendix E— Request to modify Georgia Avenue streetcar line: Letter from Councilmembers Nancy Floreen and Hans Riemer to County Executive Isiah Leggett and to Mayor Vincent Gray



MONTGOMERY COUNTY COUNCIL
ROCKVILLE, MARYLAND

November 16, 2011

The Honorable Vincent C. Gray, Mayor
District of Columbia
1350 Pennsylvania Avenue, NW, Suite 316
Washington, DC 20004

The Honorable Isiah T. Leggett
Montgomery County Executive
101 Monroe Street
Rockville, MD 20850

Dear Mayor Gray and County Executive Leggett:

Recently we took time to review the final report of the District of Columbia Department of Transportation (DDOT) entitled "DC's Transit Future System Plan" (April 2010). The report outlines plans for a comprehensive streetcar system within the District.

One of the proposed lines would run from Buzzard Point, north through downtown, continuing north on Georgia Avenue to Butternut Street, and then east to the Takoma Metro Station. Instead, would the District of Columbia consider the possibility of re-routing this line so that it proceeds north on Georgia Avenue to the Montgomery County line, and from there north to the Silver Spring Metro Station/Transit Center? While the terminus of each route is at a Metro Station, Silver Spring is also served by MARC Commuter Rail, as well as 46 bus routes and approximately 120 buses per hour in the peak hour—versus 15 bus routes and approximately 50 buses per hour at Takoma. Silver Spring will also be served by the Purple Line. Finally, there are many more opportunities for redevelopment along Georgia Avenue north of Butternut Street and in South Silver Spring that could be spurred and served by this extension.

If there is interest in both our jurisdictions, we would propose that our two DOTs engage in a sketch-planning exercise, in coordination with Washington Metropolitan Area Transit Authority, Maryland Transit Administration, and Maryland-National Capital Park and Planning Commission staffs, to determine the design and operational feasibility of this route. Given our other respective transportation priorities, we are not under the illusion that this route would come about in the next few years, or even the next decade. But we think it is important to explore this idea now to determine whether we should revise our master plans accordingly. We look forward to hearing your response.

Sincerely,

Nancy Floreen, Councilmember

Hans Riemer, Councilmember

NF.go

Copy:

Councilmembers
Arthur Holmes, Jr., Director, Montgomery County Department of Transportation
Terry Bellamy, Director, District of Columbia Department of Transportation
Françoise Carrier, Chair, Montgomery County Planning Board
Henry Kay, Executive Director for Transit Development and Delivery, Maryland Transit Administration
Nat Bottigheimer, Planning Director, Washington Metropolitan Area Transit Authority

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Appendix F—Comments received at Public Meetings on BRT Network

Thirty-five people attended the first public meeting held on October 24, 2011. The following concerns were expressed.

- ▶ The proposed BRT system will promote sprawl by encouraging people to move farther out because of the shorter travel time.
- ▶ The proposed BRT system will disadvantage transit riders who live closer in who use local bus service that will be stuck in traffic while the BRT uses dedicated lanes.
- ▶ The Randolph Road corridor should be extended to FDA/White Oak and beyond to Prince George's County destinations.
- ▶ The New Hampshire Avenue corridor should be extended from University Boulevard to FDA/White Oak.
- ▶ The transit corridor network does not have enough east-west connections.
- ▶ The MD355 and Midcounty Highway BRT corridors combined with the ICC would obviate the need to widen I-270. Also, BRT from Clarksburg should be a high priority to avoid the need to build Midcounty Highway. Clarksburg route should be extended to Hyattstown and a park-and-ride lot should be provided in Clarksburg.
- ▶ If the current bus system cannot afford to print schedules, buses can't keep on schedule, and if the current electronic schedules don't work, how can we afford a new system and why do we believe it will work better?
- ▶ Will bikes be accommodated on the BRT vehicles and will there be a conflict with bikes when buses switch lanes?
- ▶ The network should be presented in an easily understandable format similar to Metro that can be easily remembered.

Thirty-three people attended the second public meeting held on November 29, 2011. The following concerns were expressed.

- ▶ The network is too focused on downcounty areas. No service is shown to Darnestown, Poolesville, Laytonsville, Damascus, Hyattstown, and Montgomery Village. More connections need to be shown outside Montgomery County, especially Frederick.
- ▶ Need better access to Montgomery College's Germantown campus and area shopping malls.
- ▶ Better connections are needed to the ICC and BWI.
- ▶ Would like to see BRT implemented as soon as possible.
- ▶ Concern that queue jump lanes would be used by cars to jump the queue the same way that existing right turn lanes are improperly used.
- ▶ MD355 South corridor duplicates Metrorail service from Rockville to Bethesda.
- ▶ Drivers will benefit by having other people use BRT.
- ▶ Need express service from Germantown to Shady Grove via MD28 in addition to the Germantown loop.
- ▶ Network needs to show better connections to Ride On.
- ▶ Inputs for modeling and forecasting should be made available to the public for review.