

MEMORANDUM

January 22, 2021

TO: Transportation and Environment (T&E) Committee

FROM: Glenn Orlin, Senior Analyst

SUBJECT: US 29 Mobility and Reliability Study and amendment to the FY21-26 Capital Improvements Program, US 29 Managed Lane Project¹

PURPOSE: To review the study and provide guidance to the Department of Transportation

Participants

Christopher Conklin, Director, Department of Transportation (DOT)
Joana Conklin, Rapid Transit System Development Manager, Department of General Services
Corey Pitts, Planning Section Manager, Division of Transportation Engineering, DOT
Casey Anderson, Chair, Montgomery County Planning Board
David Anspacher, Supervisor, Countywide Planning, Planning staff
Jesse Cohn, Planner Coordinator, Countywide Planning, Planning staff

In May 2017 the Council approved construction funding for the US 29 FLASH service that had recently begun operations. At that time the Council also reviewed a longer term proposal by Sean Emerson and Sebastian Smoot to reconstruct the portion of US 29 between Silver Spring and Burtonsville with an exclusive lane for Bus Rapid Transit (BRT). The Council requested that the DOT study this option. DOT responded that, in addition to studying the Emerson-Smoot concept, it would also evaluate a managed lane option (express buses sharing a lane with carpools) and means for optimizing all travel modes along this section of US 29, including for motor vehicles, bicycling, and pedestrians.

In July, 2020 DOT and its consultant completed the draft study, which can be viewed here: <https://www.montgomerycountymd.gov/dot-dte/Resources/Files/US29Study/DRAFT%20-%20US%2029%20%20Mobility%20Study%20Report%20July2020.pdf>. DOT supports a managed lane option, which would repurpose as an express bus/carpool lane, the innermost lane in the southbound direction in the morning peak and in the northbound direction in the evening peak. DOT will brief the Committee from its PowerPoint presentation on ©1-19.

The Planning Board reviewed the study on October 15. It also supports proceeding in the interim with a managed lane concept, with several caveats. The Board's letter is on ©20-21, and the Planning staff's report is on ©22-40. Planning staff will summarize for the Committee its analysis and the Board's comments subsequent to DOT's presentation. Dan Wilhelm of the Greater Colesville Citizens Association (GCCA) also provided comments; they are on ©41-50.

¹ Key words: #US29, Bus Rapid Transit

The objective of this worksession is for the Committee to provide feedback and guidance to DOT regarding the next phase of this study, which the Executive is now recommending to be funded at a cost of \$6 million over the next two fiscal years (©51-53).

Alternatives studied. The Median Busway Alternative would create an exclusive busway in the median of US 29 between Tech Road and Spring Street. Between Tech Road and Stewart Lane there would be two exclusive bus lanes, one in each direction. Between Stewart Lane and Timberwood Avenue (at the north end of Four Corners) there would be a single median lane running southbound in the morning peak and northbound in the evening peak. Through Four Corners at its station there would again be two median bus lanes, one in each direction. From the Beltway to Sligo Creek Parkway it would revert to a single-lane reversible bus lane. Between Sligo Creek Parkway there are currently six travel lanes with the middle two lanes reversible: southbound in the morning peak and northbound in the evening peak. Under this alternative the “inner” of the two reversible lanes would be repurposed as a bus lane. The alternative would have stations in the same general locations as for the current FLASH system, except that they would be located adjacent to the bus lane in the median. The rough cost estimate of the transit improvements in Managed Lane Alternative is \$105 million.

The description of the Managed Lane Alternative is as follows. Between Blackburn Road and Musgrove Road in Fairland, a fourth lane in each direction would be carved out of the median for combination bus/high-occupancy vehicle (HOV) lanes. Between Musgrove Road and Stewart Lane the reinforced outside shoulders would be used as a general traffic lane southbound in the morning peak and northbound in the evening peak, allowing the existing inside travel lane to be repurposed as a bus/HOV lane southbound in the morning and northbound in the evening. Between Stewart Lane and Southwood/Burnt Mills Avenue the existing inner lane would be repurposed as a bus/HOV lane southbound in the morning and northbound in the evening. Between Southwood/Burnt Mills Avenue and Sligo Creek Parkway the buses would run in mixed traffic. Between Sligo Creek Parkway and Spring Street the treatment would be the same as under the Median Busway Alternative. This option would utilize the same stations currently used by the FLASH system, which means the buses would be weaving back and forth between the inside bus/HOV lane and the stations on the outside curb. The rough cost estimate of the transit improvements in Managed Lane Alternative is \$50 million.

The Managed Lane Alternative also includes three sets of non-transit elements, which to varying degrees would affect the performance of BRT, but which also would improve bicycle, pedestrian, and motor vehicle mobility in the US 29 Corridor. The alternative includes adding turn lanes at the US 29 intersections with Greencastle Road, Tech Road, Stewart Lane, and Sligo Creek Parkway, widening US 29 Southbound to 3 lanes over New Hampshire Avenue, and adding a second lane to the southbound-to westbound ramp from US 29 to I-495 (©31-34). It also comprises scores of bicycle-pedestrian improvements within a half-mile of each of BRT stations between the Silver Spring Metro Station and Tech Road, including the vicinity of the stations along Lockwood Drive and Stewart Lane (©54-61). Furthermore, the alternative would manage corridor traffic more comprehensively by such measures as: providing real-time traffic information through variable message boards and electronic media; developing a corridor traffic management plan incorporating US 29, I-95, US 1, and the Baltimore-Washington Parkway; increasing incident response patrols; initiating smart signal timing technology; and providing real-time commuter park-and-ride space availability. The rough costs of the roadway, bicycle-pedestrian, and traffic management elements are \$25 million, \$20 million, and \$5 million, respectively, for a total of \$50 million. All these elements could be associated with the Median Busway Alternative. Thus, to better

compare these options, the full costs of the Median Busway and Managed Lane Alternatives should be characterized as \$155 million and \$100 million, respectively.

The following chart compares the two alternatives with the No Build option:

	No Build	Median Busway	Managed Lane
2025 AM peak-hour travel time, MD 198 to MD 97			
Bus Rapid Transit	43 minutes	25 minutes	23 minutes
Carpool	46 minutes	45 minutes	19 minutes
Single-occupant vehicle	46 minutes	45 minutes	35 minutes
2025 PM peak-hour travel time, MD 97 to MD 198			
Bus Rapid Transit	32 minutes	33 minutes	25 minutes
Carpool	32 minutes	40 minutes	18 minutes
Single-occupant vehicle	32 minutes	40 minutes	19 minutes
2025 AM peak-hour person throughput	3,800	3,800	4,550
2025 PM peak-hour person throughput	4,250	3,950	4,650
Land Acquisition	-	9.8 acres	2.2 acres
Total Capital Cost	-	\$155 million	\$100 million
<i>BRT improvements</i>	-	<i>\$105 million</i>	<i>\$50 million</i>
<i>Intersection improvements</i>	-	<i>\$25 million</i>	<i>\$25 million</i>
<i>Bicycle/pedestrian improvements</i>	-	<i>\$20 million</i>	<i>\$20 million</i>
<i>Traffic management improvements</i>	-	<i>\$5 million</i>	<i>\$5 million</i>

The Planning Board and staff concur with the Managed Lane Alternative, with the following caveats:

- Shift the Tech Road station to the median. Without this modification, staff recommends removing the segment between Musgrove Road and Stewart Lane, as the benefits of this segment improvement would primarily serve auto travelers along the corridor.
- Continue to advance the master-planned vision for dedicated bus lanes on the entire corridor between the Silver Spring Transit Center and Burtonsville. While the Managed Lanes alternative improves transit operations along the corridor, it is an interim step towards fully realizing the master-planned facility.
- Do not move forward with adding a second ramp to westbound I-495 prior to evaluating and resolving the pedestrian safety issues associated with the project.
- Evaluate station access and recommend bicycle and pedestrian improvements for the Briggs Chaney, Castle Boulevard, and Burtonsville station areas.
- Provide a complete cost estimate for all bicycle and pedestrian projects identified in this study as well as the cost estimate of projects to be identified in the Briggs Chaney, Castle Boulevard, and Burtonsville station areas.
- In conjunction with the Planning Department, evaluate the pedestrian improvements identified in this study and the projects to be identified in the Briggs Chaney, Castle Boulevard, and Burtonsville station areas to determine the most critical and cost-effective projects that would

improve station access. Prioritize bicycle projects based on the prioritization put forth in the Bicycle Master Plan. Prioritize pedestrian projects using the department's Pedestrian Level of Comfort (PLOC) tool.

- Montgomery Parks staff should be included in any interagency coordination meetings regarding more detailed design of the proposed improvements.

Mr. Wilhelm's proposals suggest potential means for further reducing the costs and impacts of the Managed Lane Alternative (see especially ©45-49). These could be investigated in the initial phase of the study stage before preliminary engineering is well underway.

Council staff comments. Both DOT and the Planning Board characterize the Managed Lane Alternative as an interim solution to the vision in the Countywide Transit Corridors Functional Master Plan of 2013, which describes one or two dedicated bus lanes through most of the length of US 29. However, the Plan defers to the detailed study of each corridor to determine the ultimate cross-section:

This Plan identifies the rights-of-way necessary to facilitate the development of a network of dedicated transit lanes. It recognizes, however, that the final decision on treatment in each transit corridor must be made at the time of implementation when a transit service plan is in place and

- the benefits of accommodating BRT and/or other bus services in the dedicated lanes can be quantified;
- the traffic impacts of implementing curb lanes vs. a median busway can be more closely studied; and
- the impacts on adjacent properties can be determined.

This Plan is intended to provide flexibility for the implementing agency to make the choice of a curb or median busway as the best way to achieve dedicated lanes. [p. 30]

Since a Managed Lane Alternative shows superior results regarding BRT travel times (and mobility in general) and has much less impact on adjacent property—and with a lower cost—it should not be characterized as an 'interim' solution. Even with the scope and cost reductions suggested below, this would still be a project in the \$70-80 million range: with that level of investment, it should be considered the permanent solution.

The intersection improvements at Sligo Creek Parkway, Greencastle Road, Tech Road, and Stewart Lane, and Sligo Creek Parkway are not essential to this project. All appear to improve mobility for motor vehicles in the corridor which, while a good thing, is superfluous to a project meant to enhance the corridor's transit service. Deleting them would reduce the overall cost of the project by \$12-14 million. On the other hand, the improvement at the New Hampshire Avenue interchange and the widening of the Beltway ramp appear to be critical to the smooth operation of the BRT, although the Planning Board and staff correctly point out that an alternative means of providing for pedestrian safety must be found for the latter location.

The \$20 million proposed for bikeway and pedestrian enhancements go beyond what is necessary to serve the US 29 BRT. About \$2 million has already been spent providing bike/ped access to the FLASH stations. (As a point of comparison, the BPPA – Purple Line project is funded at only \$8.2 million.) Furthermore, the bikeway and pedestrian improvements in White Oak area should be incorporated into

the White Oak Local Area Transportation Improvement Program (LATIP), to be funded by new development. However, the Planning Board and staff are correct that such improvements should extend to the Briggs Chaney, Castle Boulevard, and Burtonsville station areas.

The proposed operational improvements are not essential to the Managed Lane BRT. Not including them would reduce the overall cost of the project by \$5 million.

Council staff recommendations:

- **Concur with DOT’s recommendation to proceed to preliminary engineering with a Managed Lane Alternative, and with the Executive’s recommendation to fund this \$6 million planning stage in the CIP, with these revisions to the PDF on ©51-53:**

Since the project would still be in the planning stage, the \$6 million must *not* be funded with General Obligation Bonds. Alternative forms of Current Revenue—such as Current Revenue-General, Transportation Impact Tax, Recordation Tax Premium, etc.—would be appropriate. DOT is urged to work with the Office of Management and Budget to find these funds by swapping with other projects that are now planned to use a type of Current Revenue but are bond-eligible.

Place this project in the “Mass Transit” category, not in the “Roads” category, as are all other BRT projects in the CIP.

- **Reduce the scope of the project to include only those non-transit elements essential to implement an effective BRT solution, as noted above.** Other BRT projects are not tasked and funded to address every mobility issue in its corridor.
- **The next phase of study should also address the issues raised by the Planning Board and the Greater Colesville Citizens’ Association early on, before getting too deep into preliminary engineering.**

Purpose of the US 29 Mobility and Reliability Study

To identify improvement(s) on US 29 to complement the investment in US 29 FLASH from Tech Road to the Silver Spring Transit Center.

- Improve corridor travel time and reliability
- Increase pedestrian and bicycle access and safety



Alternatives Evaluated

- **Full-time Dedicated Median Bus Lane:** Tech Road to Sligo Creek Parkway
- **Rush-hour Managed Bus/ HOV Lanes:** Musgrove Road to Spring Street and **Bus on shoulder** north of Musgrove Road
- **Intersection Improvements:** Select congested intersections/ interchanges
- **Transportation System Management / Transportation Demand Management** measures to reduce non-recurring congestion and encourage carpooling
- **Pedestrian and Bicycle** improvements and new connections for station access, increased walk and bike sheds (Silver Spring to Tech Road)

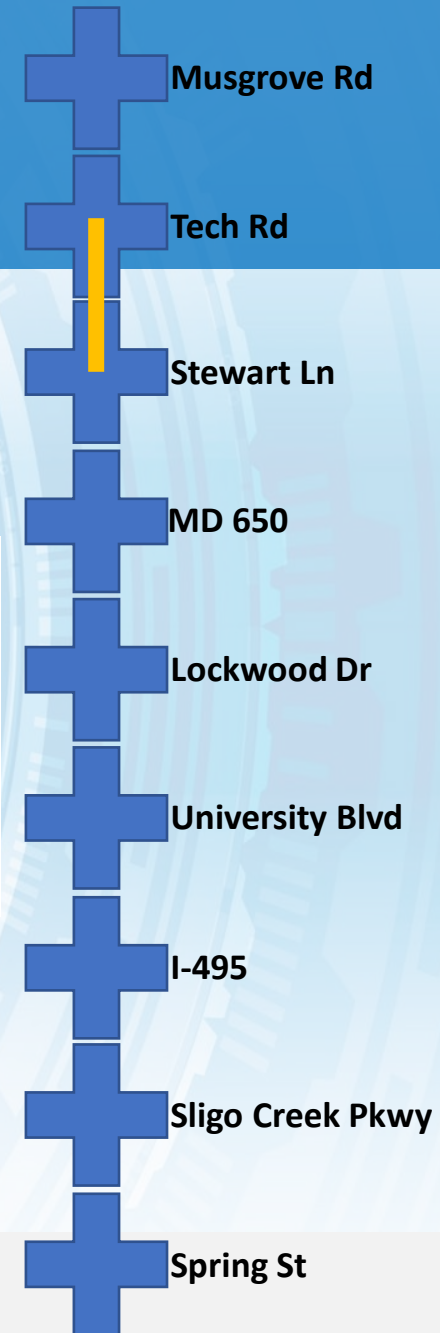
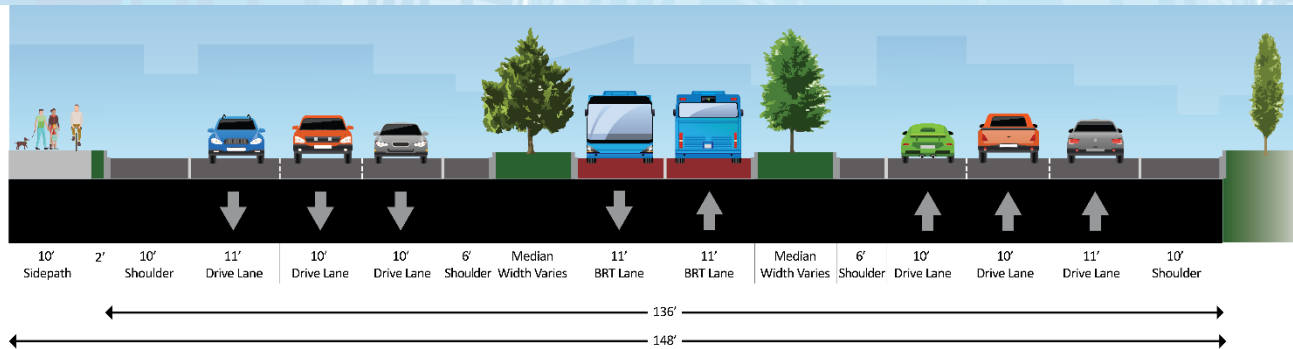
Study Measures of Performance

- Person throughput
- Travel time by mode
- Intersection/Segment Level of Service and Delay
- Impact to neighborhoods/ traffic management
- Cost



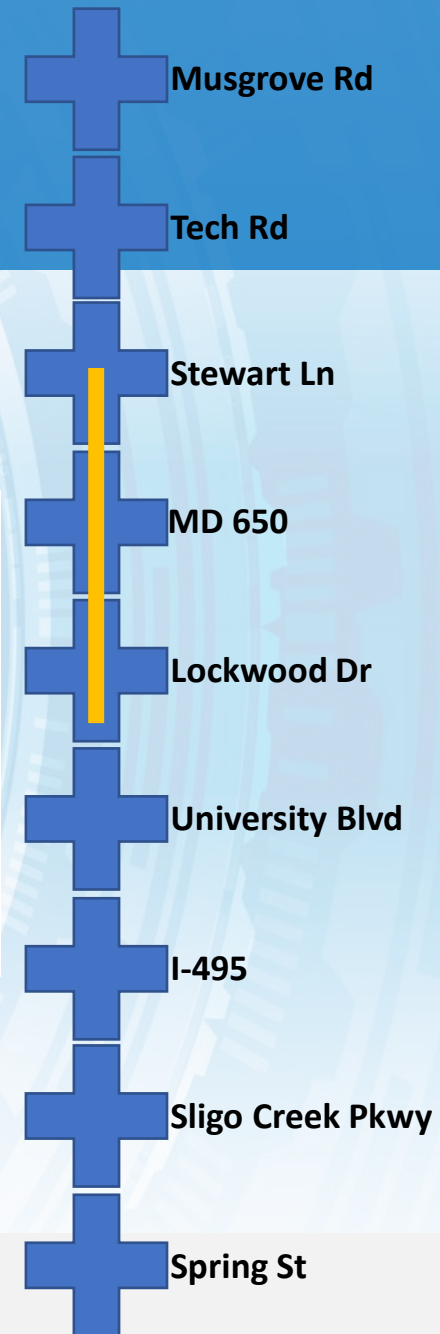
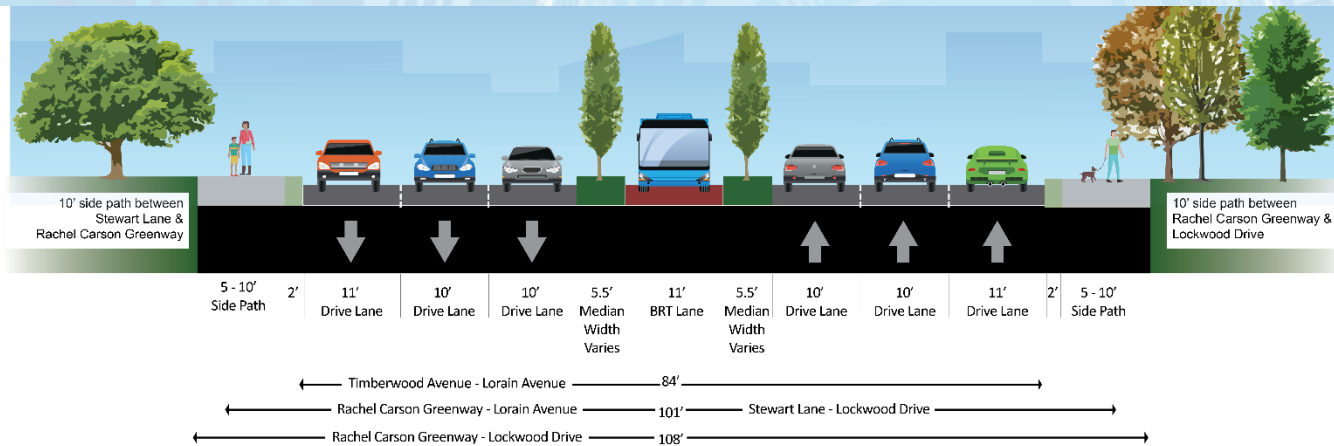
Median Bus Lane Concept

Tech Road to Stewart Lane



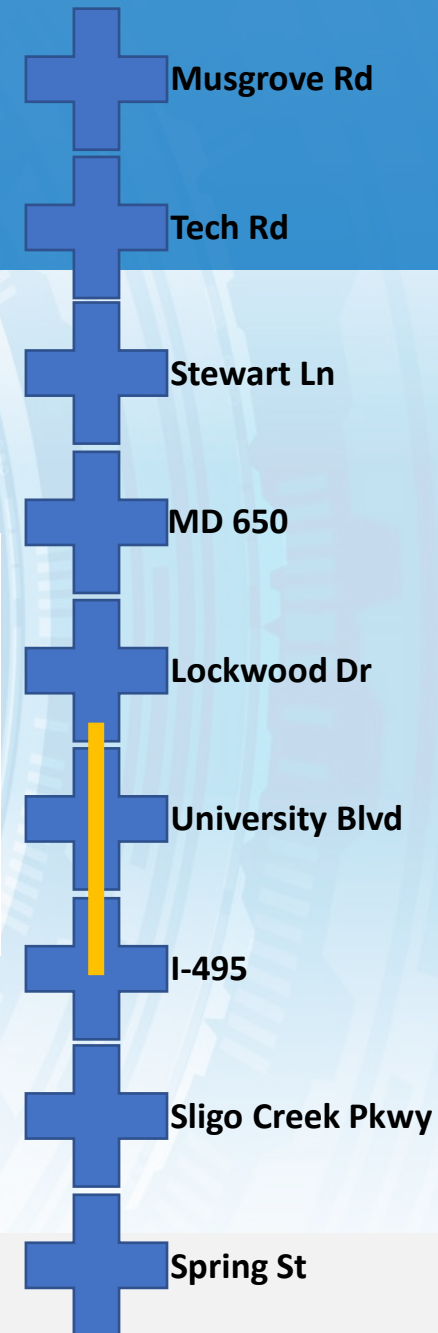
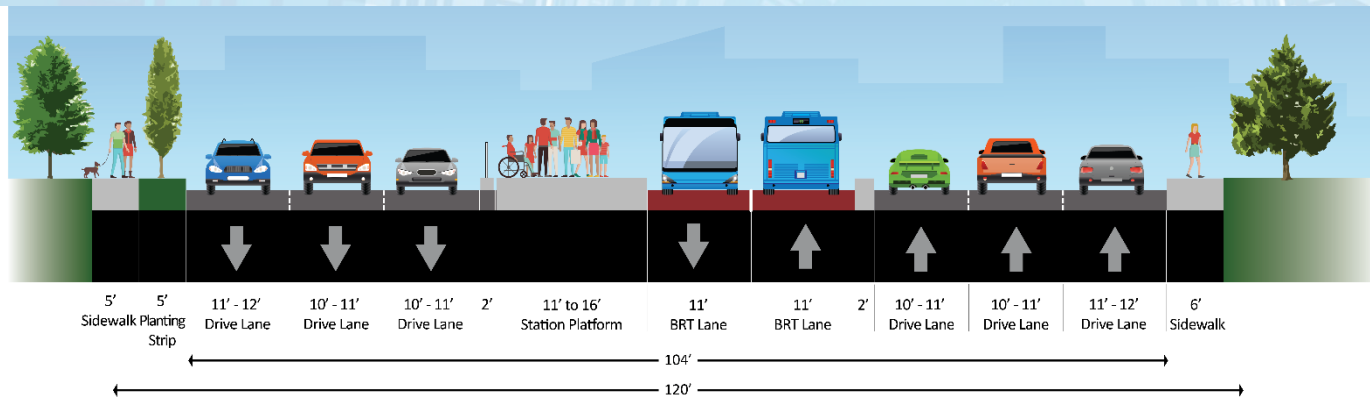
Median Bus Lane Concept

Stewart Lane to Timberwood Avenue



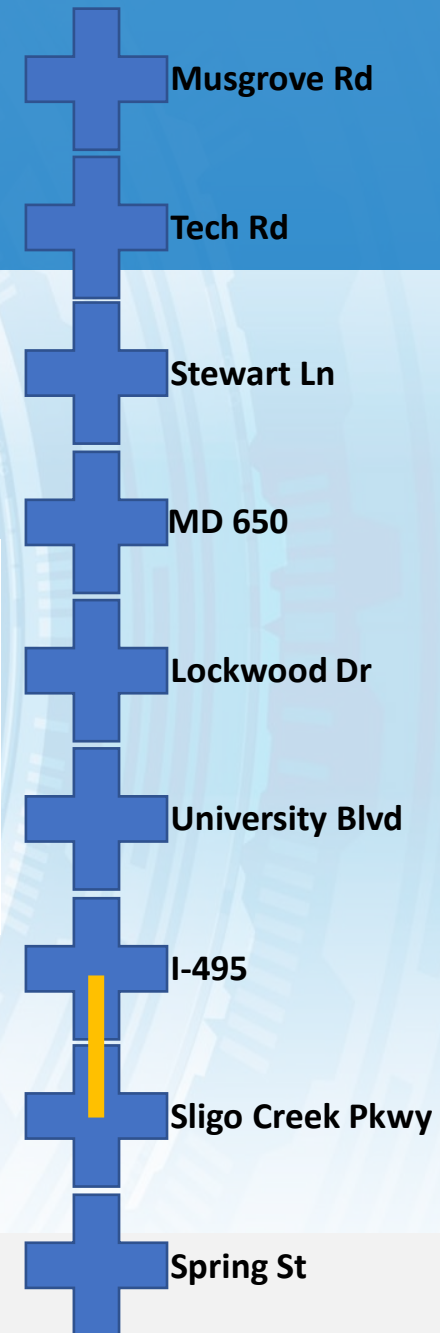
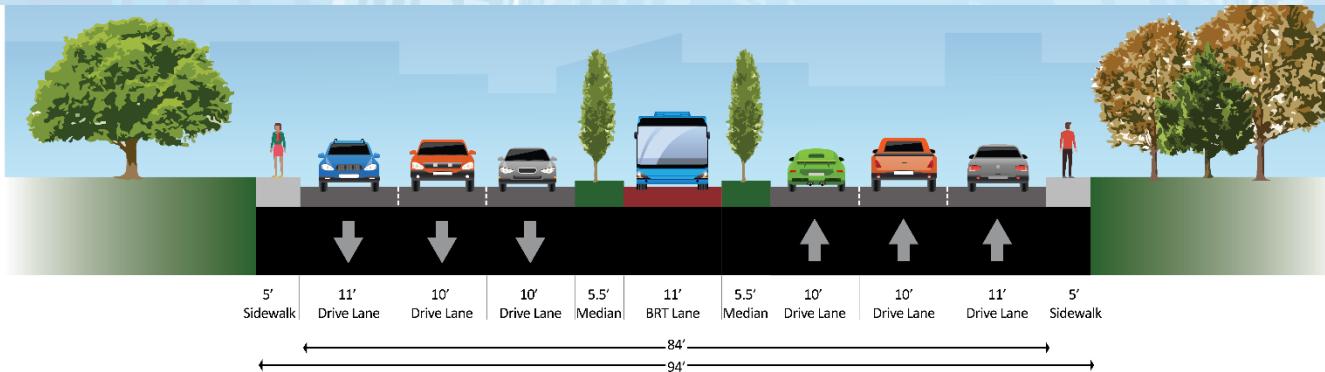
Median Bus Lane Concept

Timberwood Avenue to I-495



Median Bus Lane Concept

I-495 to Sligo Creek Parkway



Median Bus Lane Concept

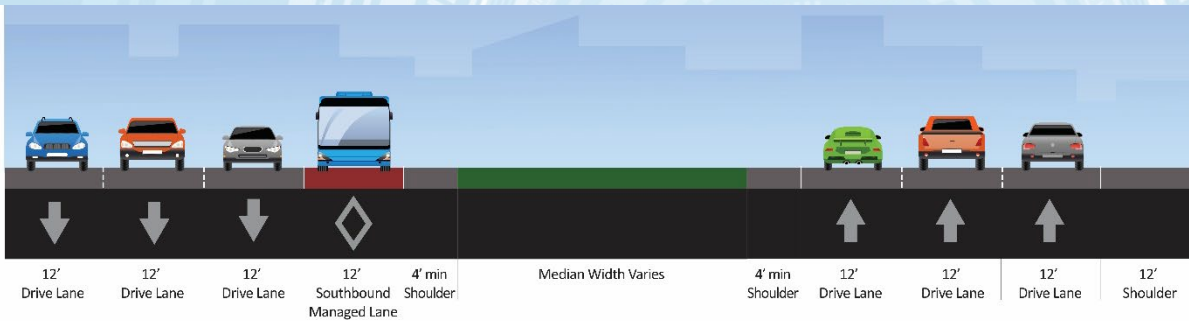
Additional Design Modifications

- Required new traffic signals and turn restrictions
- Required lane width changes

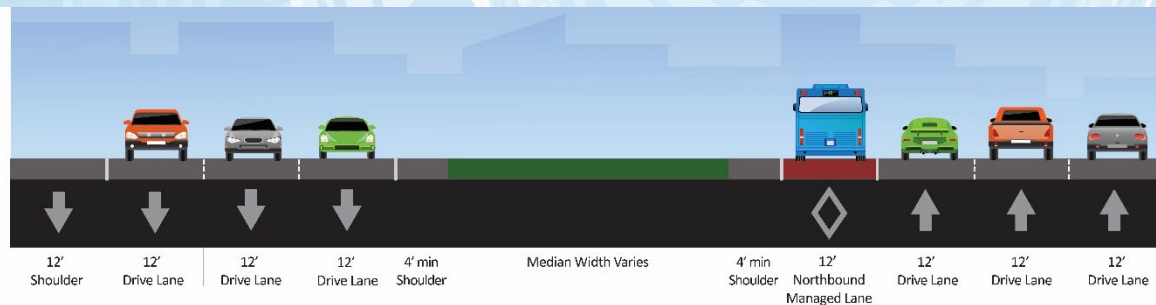
Managed Lane Concept

Musgrove Road to Stewart Lane

AM Peak Period



PM Peak Period



Sandy Spring Rd

Musgrove Rd

Tech Rd

Stewart Ln

MD 650

Lockwood Dr

University Blvd

I-495

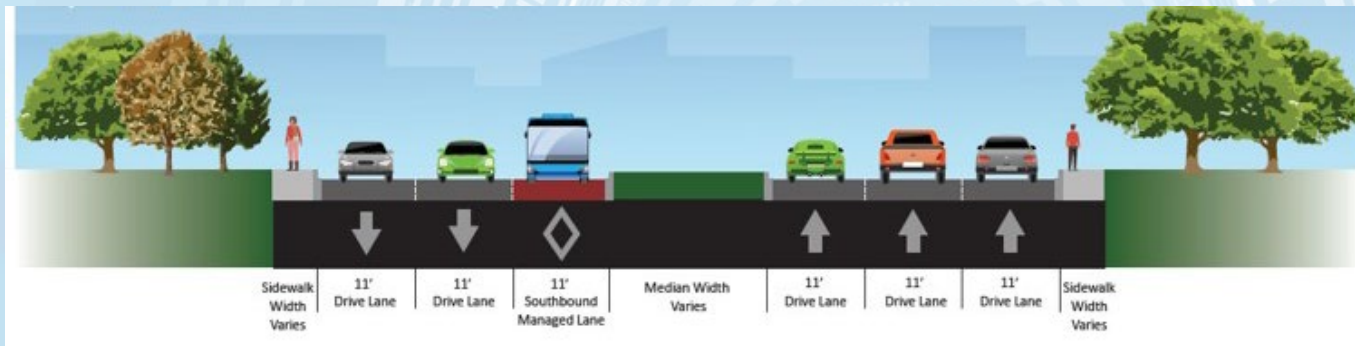
Sligo Creek Pkwy

Spring St

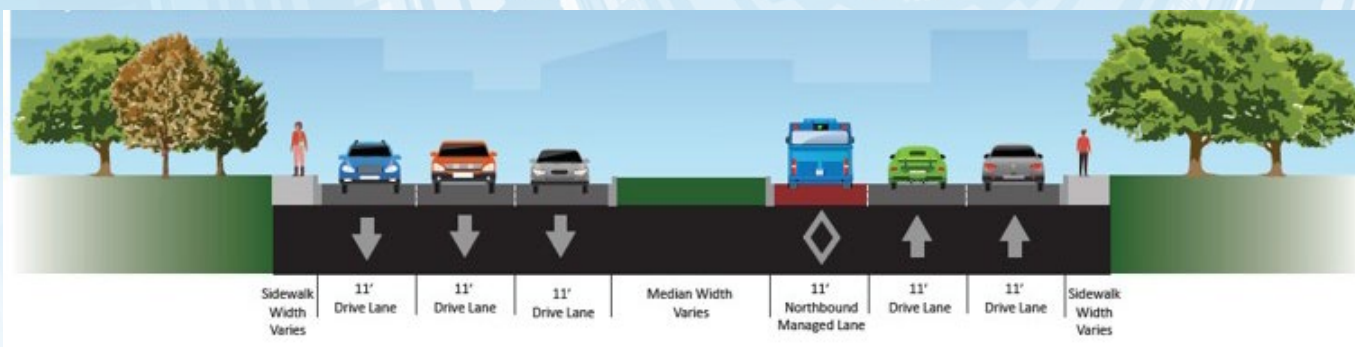
Managed Lane Concept

MD 650 to Southwood Avenue /Burnt Mills Avenue

AM Peak Period



PM Peak Period



Sandy Spring Rd

Musgrove Rd

Tech Rd

Stewart Ln

MD 650

Lockwood Dr

University Blvd

I-495

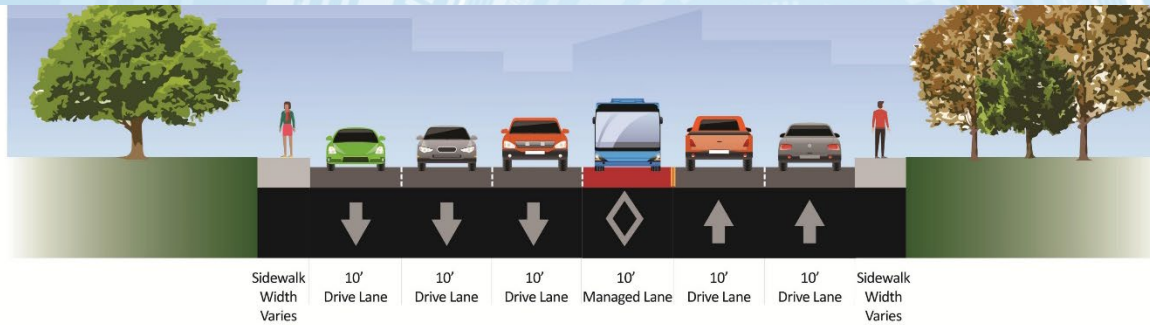
Sligo Creek Pkwy

Spring St

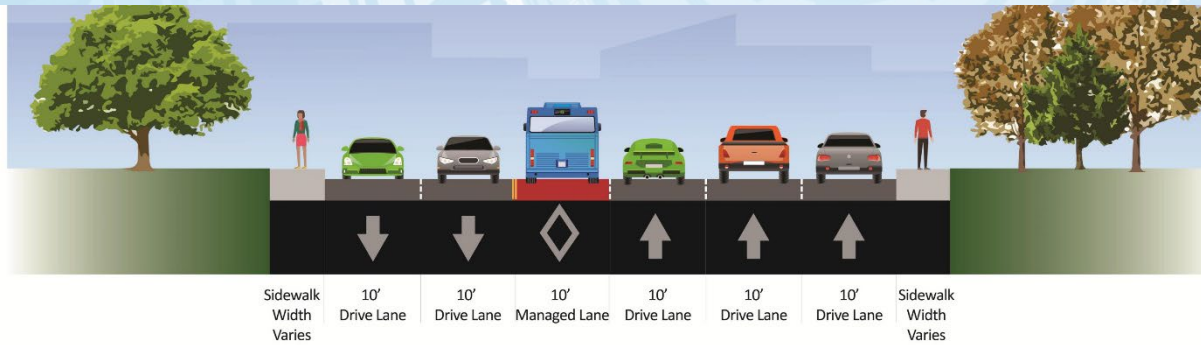
Managed Lane Concept

Sligo Creek Parkway to Spring Street

AM Peak Period



PM Peak Period



Sandy Spring Rd

Musgrove Rd

Tech Rd

Stewart Ln

MD 650

Lockwood Dr

University Blvd

I-495

Sligo Creek Pkwy

Spring St

Summary of Results

Comparison of Alternatives

	No Build	Median Bus Lane	Managed Lane
Number of Intersections LOS E/F AM(PM)	12(9)	12(13)	7(4)
Number of Segments LOS E/F AM(PM)	19(12)	20(12)	15(8)
Person Throughput AM(PM)	3800(4250)	3800(3950)	4550(4650)
Travel Time Auto in Minutes AM(PM)	46(32)	45(40)	35(19)
Travel Time HOV in Minutes AM(PM)	n/a	n/a	19(18)
Travel Time BRT in Minutes AM(PM)	43(32)	25(33)	23(25)
Right-of-Way	n/a	9.8 acres	2.2 acres
Cost	n/a	\$105-110M	\$40-50M

Priority Intersection Improvements

- Identified through an assessment of over 30 improvements
 - Greencastle Road Intersection Improvements
 - Tech Road Intersection Improvements
 - Stewart Lane Intersection Improvements
 - MD 650 Interchange Improvements
 - US 29 Southbound Exit Ramp to Westbound I-495 Improvements
 - Sligo Creek Intersection Improvements

Transportation Systems / Demand Management

- Cost: \$1-5M
- Provide real-time travel time information from the county line to I-495 and Silver Spring
- Travel Demand Management (TDM) incentive programs to encourage carpool, transit, and bicycle use
- Develop Integrated Corridor Management Plans (US 29/I-95/US 1/MD 295)
- Increase incident response patrols
- Implement smart signal technology for demand-responsive timing plans
- Provide real-time commuter park and ride space availability



Pedestrian and Bicycle Improvements

Over 200 individual walking and biking recommendations between Silver Spring and Tech Road (Cost \$15-20M*)

- New and widened sidewalks
- ADA compliance updates
- Bike routes/lanes
- US 29 crossing upgrades
- Bike parking/shares

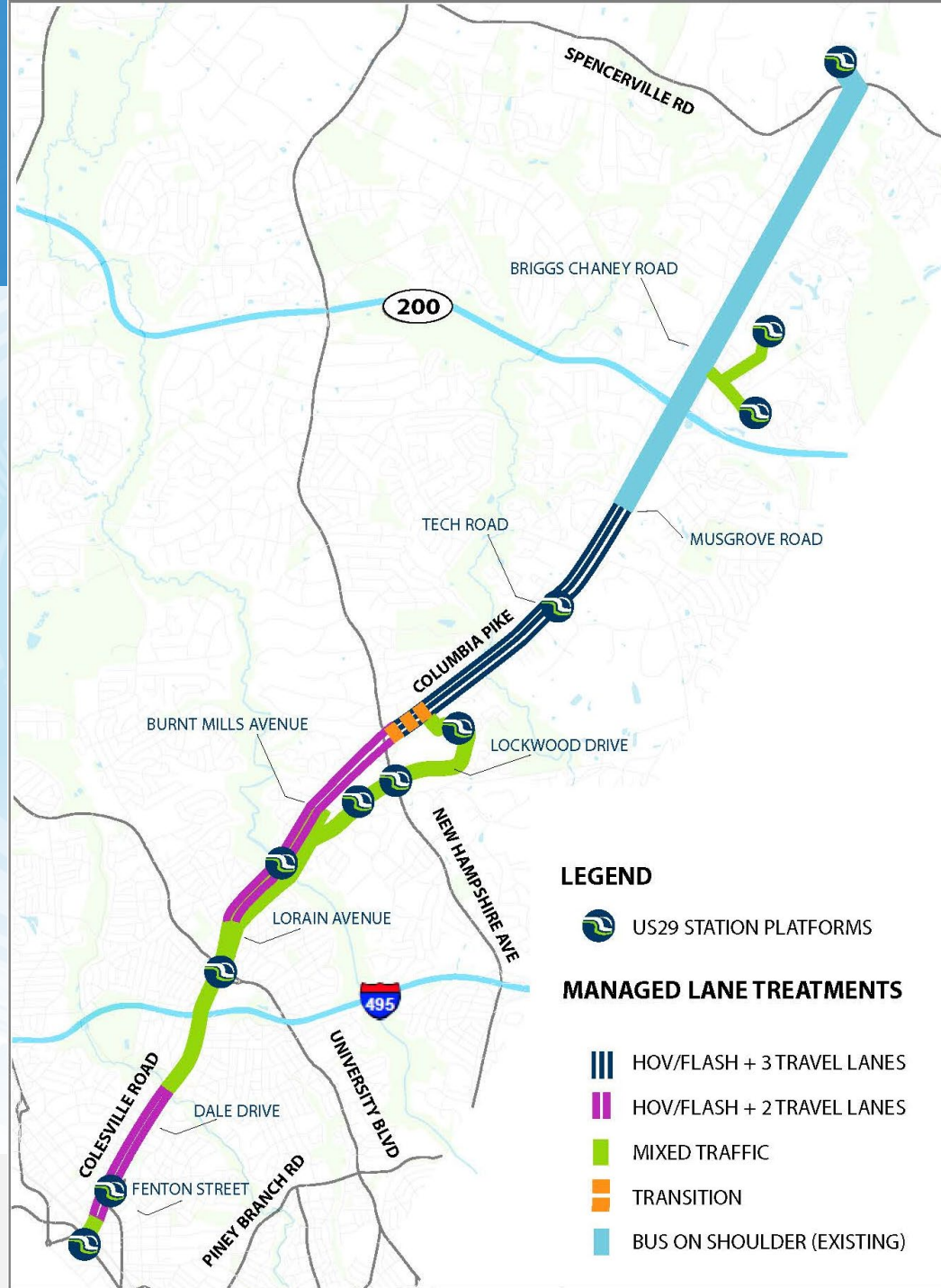
*Cost excludes sidepaths and bridges

US 29 Mobility and Reliability Study



Proposed Recommendations

- Advance managed lane concept (\$40-50M)
 - **Musgrove Road to Stewart Lane** – Peak Period/Direction HOV + Bus Managed Lane with Hard Running Shoulder
 - **MD 650 to Southwood/Burnt Mills** – Peak Period/Direction HOV + Bus Managed Lane
 - **Sligo Creek Parkway to Spring Street** – Peak Period/Direction HOV + Bus Managed Lane



Proposed Recommendations

Continued

- Advance intersection/interchange improvements (\$20-25M)
 - Greencastle Road intersection improvements
 - Tech Road intersection improvements
 - Stewart Lane intersection improvements
 - MD 650 interchange improvements
 - I-495 interchange improvements (US 29 SB)
 - Sligo Creek intersection improvements
- Advance station access (bike/ped) improvements (\$15-20M)

Outreach

- Various stakeholder briefings
 - M-NCPPC staff
 - MDOT SHA
- US 29 BRT Corridor Advisory Committee – May 2018
- Public Open House #1 – November 2018
- South Four Corners Civic Association – February 2019
- *Virtual* Public Open House #2 – July 2020

Next Steps

- Advance design for selected alternative(s) pending additional funding
 - Resolve managed lane location
 - Refine designs and cost estimates
- Future improvements/phases



MONTGOMERY COUNTY PLANNING BOARD
THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

October 19, 2020

The Honorable Sidney Katz
President, Montgomery County Council
Council Office Building
100 Maryland Avenue, 6th Floor
Rockville, Maryland 20850

Re: US 29 Mobility & Reliability Study

Dear President Katz:

On October 15, 2020, the Montgomery County Planning Board reviewed the US 29 Mobility & Reliability Study and made the following comments:

1. Advance the Managed Lanes alternative, with one modification: shift the Tech Road station to the median. Without this modification, staff recommends removing the segment between Musgrove Road and Stewart Lane, as the benefits of this segment improvement would primarily serve auto travelers along the corridor.
2. Continue to advance the master-planned vision for dedicated bus lanes on the entire corridor between the Silver Spring Transit Center and Burtonsville. While the Managed Lanes alternative improves transit operations along the corridor, it is an interim step towards fully realizing the master-planned facility.
3. Do not move forward with adding a second ramp to westbound I-495 prior to evaluating and resolving the pedestrian safety issues associated with the project.
4. Evaluate station access and recommend bicycle and pedestrian improvements for the Briggs Chaney, Castle Boulevard, and Burtonsville station areas.
5. Provide a complete cost estimate for all bicycle and pedestrian projects identified in this study as well as the cost estimate of projects to be identified in the Briggs Chaney, Castle Boulevard, and Burtonsville station areas.
6. In conjunction with the Planning Department, evaluate the pedestrian improvements identified in this study and the projects to be identified in the Briggs Chaney, Castle Boulevard, and Burtonsville station areas to determine the most critical and cost-effective projects that would improve station access. Prioritize bicycle projects based

The Honorable Sidney Katz

October 19, 2020

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on the prioritization put forth in the Bicycle Master Plan. Prioritize pedestrian projects using the department's Pedestrian Level of Comfort (PLOC) tool.

7. Montgomery Parks staff should be included in any interagency coordination meetings regarding more detailed design of the proposed improvements.

Thank you for your attention to this matter. If you have any questions or comments concerning our review, please contact Jesse Cohn at jesse.cohn@montgomeryplanning.org or 301-495-2197.

Sincerely,



Casey Anderson
Chair

CA:JC:aj

cc: Glenn Orlin, Montgomery County Council
Chris Conklin, Montgomery County Department of Transportation
Corey Pitts, Montgomery County Department of Transportation
Dan Sheridan, Montgomery County Department of Transportation
Joana Conklin, Montgomery County Department General Services
Jason Sartori, Montgomery County Planning Department
Jesse Cohn, Montgomery County Planning Department
David Anspacher, Montgomery County Planning Department



US 29 Mobility & Reliability Study

JC

Jesse Cohn, Planner Coordinator, Countywide Planning, jesse.cohn@montgomeryplanning.org, 301-495-2197

DA

David Anspacher, Supervisor, Countywide Planning, david.anspacher@montgomeryplanning.org, 301-495-2191

JS

Jason Sartori, Chief, Countywide Planning, jason.sartori@montgomeryplanning.org, 301-495-2172

Completed: 10/8/2020

STUDY DESCRIPTION

The US 29 Mobility & Reliability Study (**Attachment A**) identifies improvements on US 29 to complement the investment in FLASH bus service, which is anticipated to begin operating on October 14, 2020. The study aims to improve transit, carpool, or overall vehicle corridor travel time and reliability performance, as well as pedestrian and bicycle access within the FLASH station area and adjacent neighborhoods between Silver Spring and Tech Road.

Specifically, this study compares two bus priority alternatives: the Median Bus Lane alternative developed by two US 29 Corridor Advisory Committee members, and a Managed Lanes alternative with targeted intersection and segment improvements.

RECOMMENDATIONS

Staff recommends transmitting the following comments to the Montgomery County Department of Transportation (MCDOT) and the County Council's Transportation Energy and Environment (T&E) Committee:

- Advance the Managed Lanes alternative, with one modification: shift the Tech Road station to the median. Without this modification, staff recommends removing the segment between Musgrove Road and Stewart Lane, as the benefits of this segment improvement would primarily serve auto travelers along the corridor.
- Continue to advance the master-planned vision for dedicated bus lanes on the entire corridor between the Silver Spring Transit Center and Burtonsville. While the Managed Lanes alternative improves transit operations along the corridor, it is an interim step towards fully realizing the master-planned facility.
- Do not move forward with adding a second ramp to westbound I-495 prior to evaluating and resolving the pedestrian safety issues associated with the project.
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- Provide a complete cost estimate for all bicycle and pedestrian projects identified in this study as well as the cost estimate of projects to be identified in the Briggs Chaney, Castle Boulevard, and Burtonsville station areas.
- In conjunction with the Planning Department, evaluate the pedestrian improvements identified in this study and the projects to be identified in the Briggs Chaney, Castle Boulevard, and

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- Montgomery Parks staff should be included in any interagency coordination meetings regarding more detailed design of the proposed improvements.

BACKGROUND

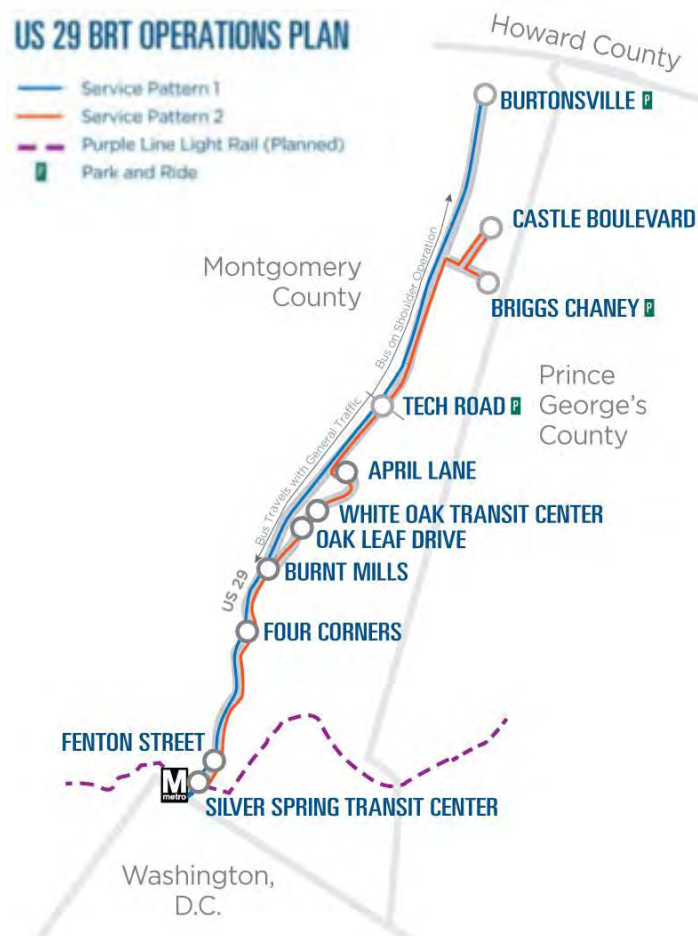
BRT is a high-quality and high-capacity bus-based transit system that delivers fast, comfortable, reliable and cost-effective transit service. It does this through the provision of dedicated transit lanes, branded stations and buses, off-board fare collection, real time information and fast and frequent operations, among other things. Because BRT contains features similar to a light rail or metro system, it is more reliable, convenient and faster than other bus services. With the right features, BRT can avoid the causes of delay that slow local bus services.

The Master Plan of Highways and Transitways (MPOHT) is the guiding policy document for BRT in Montgomery County along US 29. The functional master plan identifies 10 bus rapid transit corridors and includes recommendations for:

- Master-planned rights-of-way
- Station locations
- Recommendations for dedicated transit lanes
- Number of additional lanes that can be added to the road to provide dedicated bus lanes

Though a project phasing plan has not formally been adopted by MCDOT, for descriptive purposes, implementation of bus rapid transit on US 29 can be broken down into at least three phases.

Phase 1 is currently under construction and expected to be open on October 14, 2020 as the Route 29 FLASH. It includes a 14-mile transit route along US 29 and local streets, from the Silver Spring Transit Center (SSTC) to the Burtonsville Park-and-Ride, as shown on in the figure to the right. The project has evolved from a previous conceptual plan, the US 29 Corridor Planning Study: Corridor Report (April 2017), and is currently being advanced by



the Montgomery County Department of Transportation (MCDOT) in cooperation with the Federal Transit Administration.

Phase 2 is the subject of this Planning Board review and arose as a follow-on project to the US 29 FLASH project. The focus of this study is to:

- Evaluate two transit concepts: Median Bus Lane and Managed Lanes alternatives.
- Examine intersection and traffic improvements that will benefit both transit and vehicle travel and that improve traffic independent of the transit improvements.
- Identify new bicycle and pedestrian station access improvements.

Future phases, when initiated, will further advance BRT on US 29 to the master plan vision of dedicated bus lanes from Burtonsville to the Silver Spring Transit Center.

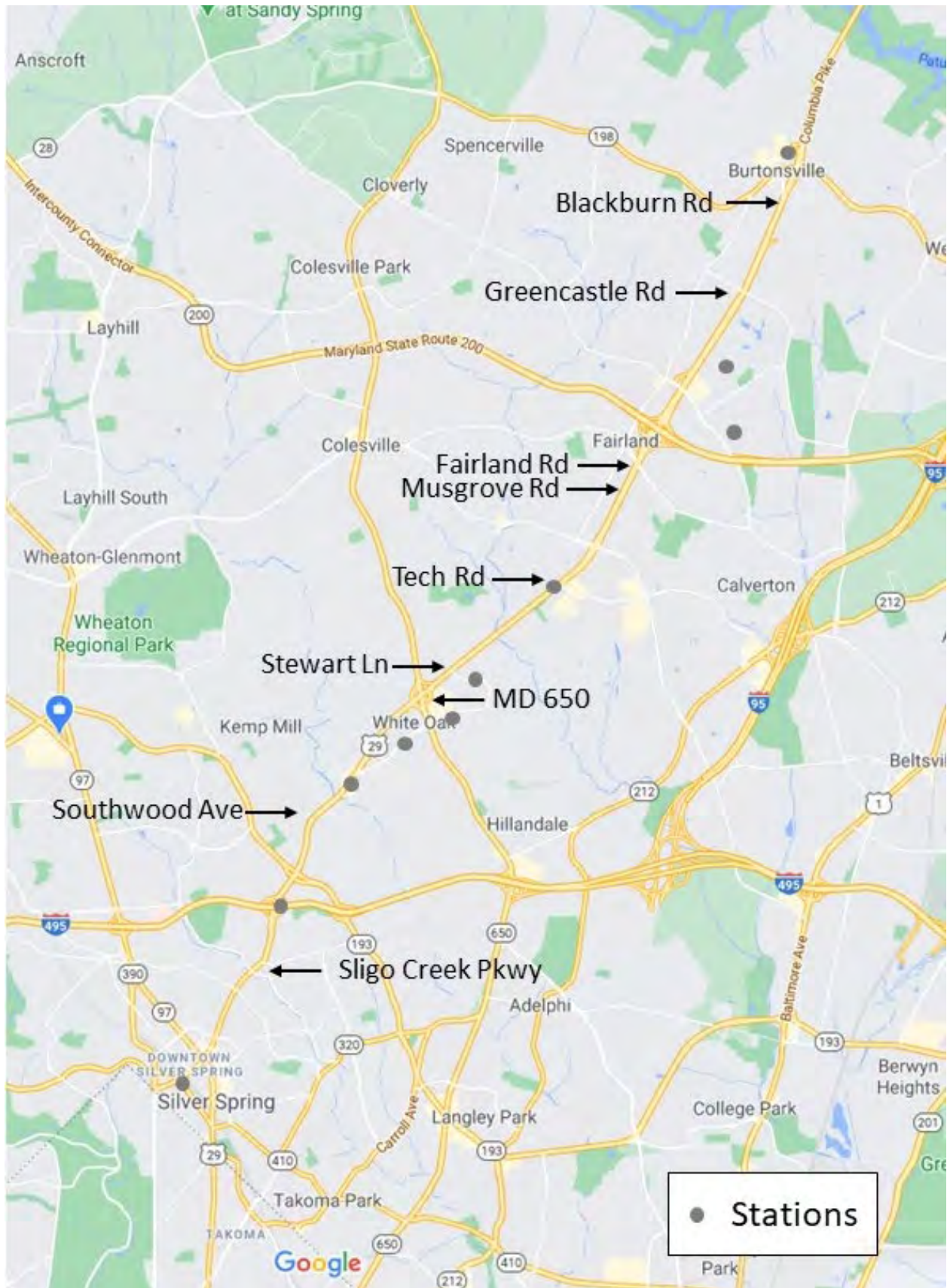
MCDOT's Recommendations

MCDOT proposes short-term and mid-term recommendations along the US 29 corridor:

- **Short-term Recommendations:**
 - Prioritize pedestrian and bicycle improvements around bus stops.
 - Design and construct intersection and interchange improvements at Greencastle Road, Tech Road, Stewart Lane, MD 650, I-495, and Sligo Creek Parkway.
 - Implement technology-focused Traffic Management Solutions, such as real-time travel information and commuter incentive programs to encourage carpooling.
- **Mid-term Recommendations**
 - From Musgrove Road to Stewart Lane, the inner lane becomes a bus/carpool lane in the southbound direction in the AM peak, with the outside shoulder hardened and converted to a general-purpose lane. In the PM peak, the northbound inner lane becomes a bus/carpool lane and the outside shoulder is hardened and converted to a general-purpose lane.
 - From MD 650 (New Hampshire Avenue) to Southwood Avenue, the inner lane becomes a bus/carpool lane in the southbound direction in the AM peak. In the PM peak, the northbound inner lane becomes a bus/carpool lane from Burnt Mills Avenue to MD 650.
 - From Spring Street to Sligo Creek Parkway, a reversible lane is implemented using the existing reversible lane. In the AM peak, there will be four southbound lanes, with the left lane serving as a bus/carpool lane, and two northbound lanes. In the PM peak, the northbound direction will have four lanes, with the inner lane serving as a bus/carpool lane.

The map on the following page highlights the key intersections and stations along the corridor.

The total project cost is \$100 million: \$20 million (pedestrian/ bicycle improvements), \$5 million (traffic management), \$25 million (intersection/ interchange improvements) and \$50 million (bus/carpool lane improvements).



Previous Studies

There is a long history of planning for enhanced bus service on the US 29 Corridor, including:

- Design of the US 29 FLASH Phase 1, as described above.
- In April 2017, the Maryland Department of Transportation completed the US 29 Corridor Planning Study: Corridor Report. This study evaluated several alternatives for BRT.
- In 2014, WMATA completed the Metrobus Z Line Study, which evaluated operational improvements on this corridor.
- In November 2013, the County Council approved the Countywide Transit Corridors Functional Master Plan. This plan identified a network of bus rapid transit corridors, identified those corridor segments where lanes would be dedicated for transit, recommended a minimum right-of-way for each road and identified station locations.
- In July 2011, MCDOT completed the Countywide Bus Rapid Transit Study. This study found that a BRT network could operate effectively and substantially increase transit use within the County. The US 29 corridor was identified as one of the corridors in this network.
- US 29 Median Bus Priority Lanes Study (2003).
- US 29 Bus Operations MD 198 to Tech Road (2001).
- Bus Priority Study US 29 Corridor (1999).
- US 29 Busway Feasibility Study (1996).

Previous Planning Board Actions

On July 26, 2018, the Planning Board reviewed the 65% design for the US 29 Bus Rapid Transit Project (MR2018038) and provided comments to MCDOT (**Attachment B**)

On February 16, 2017, the Planning Board reviewed the draft US 29 Bus Rapid Transit Corridor Study report and provided comments to MCDOT (**Attachment C**).

TRANSIT ALTERNATIVES

This section of the staff report describes and evaluates two transitway alternatives and provides staff recommendations on a preferred alternative.

Description

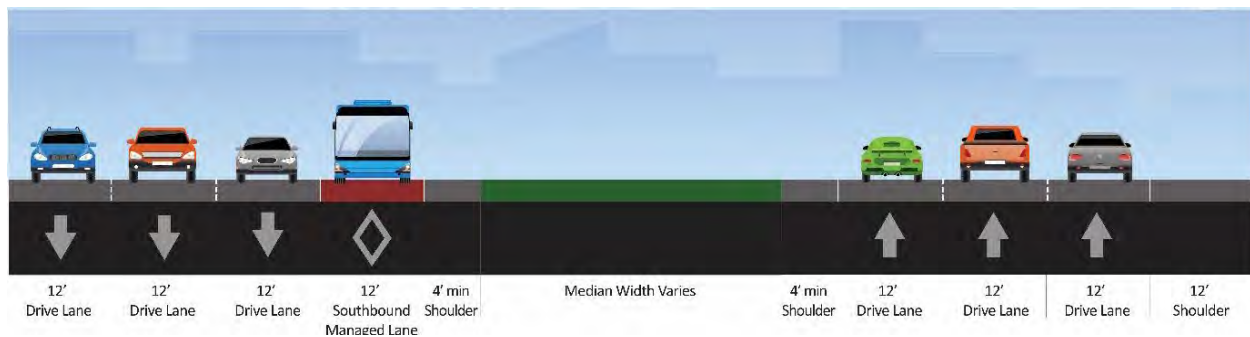
The study evaluates two transit options: the Median Bus Lane and Managed Lanes alternatives:

- **Median Bus Lane Alternative:** The Median Bus Lane alternative (also known as the Emerson Smoot concept, as it was proposed by two members of the US 29 Corridor Advisory Committee) has a dedicated median bus lane from Sligo Creek Parkway to Tech Road. The alternative includes a single, bidirectional lane busway that expands to two lanes at the stations to enable passing and to enable buses traveling in both directions to be stopped at the station at the same time. In the Median Bus Lane scenario, there are changes from existing conditions, including new traffic signals (at Oak Leaf Drive, Northwest Drive, Hillwood Drive, Crestmoor Drive, Timberwood Avenue, Lanark Way and Hastings Drive), turn restrictions, and new crosswalks. Other changes include lane width reductions, removal of travel lanes through Four Corners, and repurposing the median.

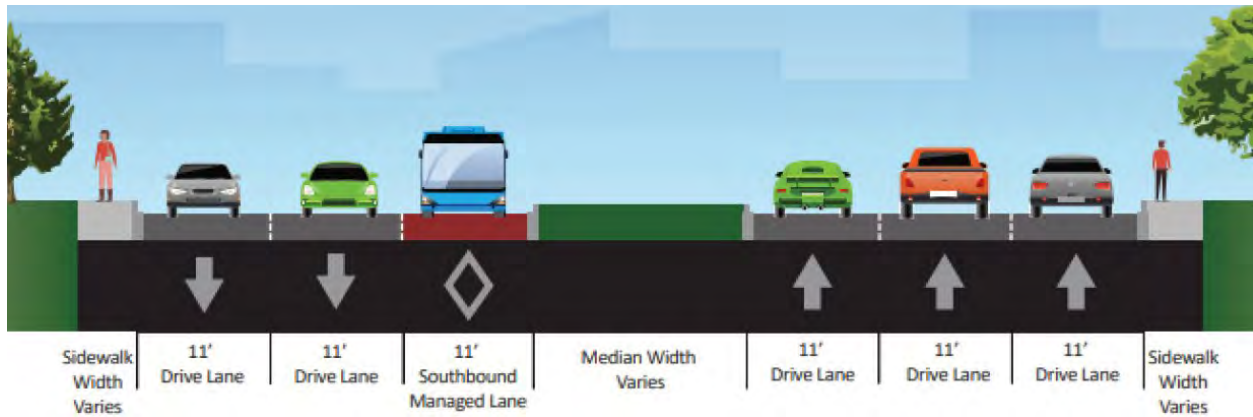
- Managed Lanes Alternative:** In contrast to the Median Bus Lane alternative, the Managed Lanes alternative increases both transit and motor vehicle capacity. The Managed Lanes alternative is a combination of full-time bus/carpool lanes, peak period managed bus/carpool lanes, and hard shoulder running in multiple segments of the corridor. Managed lanes would be denoted through a mix of pavement markings and overhead dynamic signs. The images below, excerpted from the study, depict the AM southbound condition for each segment.
 - From Blackburn Road to Fairland Road, a full-time bus/carpool lane is included on the inner shoulder of both northbound and southbound US- 29. The existing shoulders on the side of the road would be rebuilt to traffic lane standards and converted to full-time general purpose lanes. **It should be noted that while this segment is included in the alternative evaluation, MCDOT's recommended package of improvements does not include this segment of the Managed Lanes alternative.**



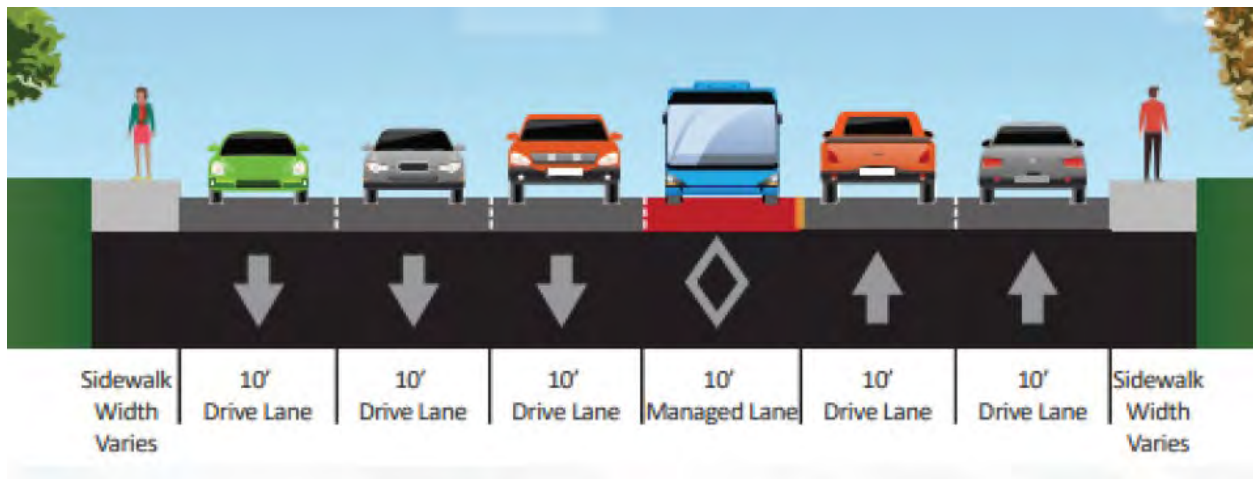
- From Musgrove Road to Stewart Lane, the inner lane becomes a bus/carpool lane in the southbound direction in the AM peak, with the outside shoulder being converted to a general purpose lane. In the PM peak, the northbound inner lane becomes a bus/carpool lane and the outside shoulder is converted to a general purpose lane.



- From MD 650 (New Hampshire Avenue) to Southwood Avenue, the inner lane becomes a bus/carpool lane in the southbound direction in the AM peak. In the PM peak, the northbound inner lane becomes a bus/carpool lane from Burnt Mills Avenue to MD 650.



- From Spring Street to Sligo Creek Parkway, a reversible lane is proposed. In the AM peak, there will be four southbound lanes, with the left lane serving as a bus/carpool lane, and two northbound lanes. In the PM peak, the northbound direction will have four lanes, with the inner lane serving as a bus/carpool lane.



The Managed Lanes alternative assumes a 10% increase in carpool trips (from 15% to 25% of corridor traffic). In addition, the evaluation of the Managed Lanes alternative includes implementation of the six intersection improvements outlined in the following section.

Analysis

The study evaluates each alternative, finding that the Managed Lanes alternative (including the intersection improvements) is expected to perform better than the Median Bus Lane alternative for overall traffic operations, person throughput and travel time reliability. Cost estimates were developed for the two alternatives, estimating \$105 million for the Median Bus Lane alternative and \$117 million for the Managed Lanes alternative (including \$92 million for the Managed Lanes transit improvements and \$25 million for the intersection improvements). Based on these results, the study recommends the Managed Lanes alternative for construction (but does not advance the segment between Blackburn

Road and Fairland Road). The resulting cost when this segment is removed is \$75 million (\$50 million for the Managed Lanes transit improvements and \$25 million for the intersection improvements).¹

It is important to note that the analysis approach advantages the Managed Lanes alternative. Task 3 of the study scope (**Attachment D**) states that the project will include a review and comparison of the Median Bus Lane alternative to the No Action and Managed Lanes alternatives, including recommendations on improvements to the concepts. However, this is not what is applied in the study's analysis. Instead, the No Action and Median Bus Lane alternatives are evaluated as proposed by the US 29 Corridor Advisory Committee members. Additional operational changes to improve the traveler's experience and/or safety were not added as part of this study. In contrast, the Managed Lanes alternative is evaluated with operational improvements, but not as a standalone transit project. This approach disadvantages the Median Bus Lane alternative by not recommending or evaluating operational tweaks that could improve performance.

In addition, the analysis does not address latent or induced demand. The concept of induced demand is that when more space is provided for driving, more people choose to drive. The Managed Lanes alternative assumes a 10% shift from single-occupancy vehicles to high-occupancy vehicles. The assumption in the analysis is that this would take 5% of cars off the road (10% of drivers would now be driving together, requiring half as many vehicles). However, as more people choose to carpool, this is likely to induce some travel to the corridor. By assuming changes associated with carpool but not with latent demand, the approach does not fully capture travel behavior in the Managed Lanes alternative and provides an optimistic estimate of congestion.

Staff understands that assumptions and decisions needed to be made to stay within the project budget and schedule. However, this approach limits our ability to conduct an apples-to-apples comparison of the alternatives and fully understand their merits and costs. **While the study conclusion that the Managed Lanes alternative has a higher cost-benefit ratio than the Median Bus Lanes alternative may be the case, staff cannot conclusively support this finding based on the analysis that was completed.**

The Managed Lanes segment between Musgrove Road and Stewart Lane is primarily a roadway capacity project. The analyzed alternative provides dedicated space for transit, but it also increases roadway capacity through the addition of peak-hour carpool lanes, making it easier for drivers and carpooling travelers to get to Silver Spring. While carpool restrictions could be tightened over the coming years (from HOV-2 to HOV-3 and ultimately to bus only lanes), staff is concerned that it will be more challenging to "take away" this new roadway capacity once it is added. The provision of new vehicle capacity in the short-term should not come at the expense of more comprehensive bus rapid transit implementation in the long term.

This segment between Musgrove Road and Stewart Lane conflicts with the Master Plan of Highways and Transitways (MPOHT). The MPOHT recommends dedicated transit lanes between along this segment of the corridor and permits the addition of two transit lanes. However, the plans specify that this corridor include six vehicle lanes and two transit lanes. The recommended Managed Lanes alternative would provide six general-purpose vehicle lanes as well as two peak-period shared bus/carpool lanes between

¹ The \$75 million represents a portion of the total \$100 million cost estimate. In addition to the \$75 million for the transit and intersection improvements, the project recommendations include \$20 million for pedestrian and bicycle improvements and \$5 million for traffic management.

Musgrove Road and Stewart Lane. This additional peak hour vehicle capacity for carpooling vehicles conflicts with the master plan recommendation for the corridor.

This segment of the corridor is 2.1 miles long, and the shared bus/carpool lane is along the inner (left) lane along this segment. The Tech Road station is on the right side of the road, approximately 1.3 miles north of Stewart Lane. Northbound transit vehicles will need to shift out of the left, shared bus/carpool lane to access the Tech Road station. In some cases, they may not reenter the left lane for the remaining 0.8 miles of the shared bus/carpool lane heading north to Musgrove Road. Similarly, southbound, buses coming from the north would also have to maneuver to the right lane at the Tech Road station. It would take them some distance to do so, as well as some distance to shift back into the left, shared bus/carpool lane after leaving the Tech Road station, due to the need to find a gap in traffic. As a result, buses are not likely to use the bus/carpool lanes for the full extent of this segment, and therefore do not capture the full travel time benefits of the managed lane. In addition, where buses do not use the shared bus/carpool lane, the lane would just be utilized by carpooling vehicles. **If the Tech Road station were relocated to the median, buses would be able to utilize the shared bus/carpool lane for the entire corridor.**

The stations are modular by design, and most of the station elements could be moved to a new location if needed. While there would be costs associated with moving the station and constructing bus pull-offs alongside the median, these costs are expected to be marginal relative to the scale of the project and should not be the limiting factor to providing improved transit service.

As part of the US 29 FLASH, expected to open on October 14, 2020, FLASH buses will use the shoulder when travel speeds in the general-purpose lanes slow down. However, the shoulders along the corridor are not intended for vehicle use, and therefore will need to be “hardened” or improved in the long-term. Hardening the shoulder is part of the Managed Lanes improvements between Musgrove Road and Stewart Lane and would benefit not just the Managed Lanes roadway configuration, but also provide a needed benefit to the transit corridor.

The proposed improvements along this portion of the corridor, primarily hardening of the shoulder, are expected to cost \$40 million. Given the County has limited funds to spend on bus rapid transit projects, staff is concerned that this segment may not be the best investment for the expected transit benefit. **Given the balance of benefits and drawbacks of this segment, staff leans toward not making these improvements unless the Tech Road station is moved to the median.**

Master Plan Consistency

As mentioned in the previous section, the MPOHT provides guidance on the US 29 corridor. Dedicated lanes are recommended from MD 198 (Sandy Spring Road) all the south to the intersection of Colesville Road and 16th Street. Two additional lanes for transit are permitted between MD 198 and Stewart Lane, but the rest of the corridor is expected to provide the dedicated transit lane by repurposing existing travel lanes. Between Sligo Creek Parkway and Georgia Avenue, the six existing general purpose lanes operate during peak hours as four lanes in the peak direction and two lanes in the off-peak direction. The plan recommends that the operation in peak hours include a dedicated lane in the peak direction.

Neither the Median Bus Lane and Managed Lanes alternatives fully meet the long-term vision for the corridor as set out in the MPOHT. However, they both represent an improvement to transit service along the corridor and a step towards realizing that long-term vision. The Countywide Transit Corridors

Functional Master Plan recognizes that implementation of many of the recommendations in the plan are likely to be incremental, stating, “This Plan does not envision that full-time dedicated bus lanes will be implemented as a first step in most locations...Since a large part of the initial ridership for BRT service will come from existing transit users whose numbers do not warrant a high level of treatment at this time, it is likely that there will be an incremental introduction of priority treatments and features that, with actual operating and ridership experience, ultimately lead to the maximum level of treatment appropriate for the specific corridor in question.” **Attachment E** summarizes the master-planned right-of-way.

Recommendations

Planning staff finds itself in a difficult position. On the one hand, this study was a substantial investment of time and resources. A recommendation to pursue further analysis might delay implementation of additional transit improvements on US 29 and entail a substantial cost during a difficult financial period for the county. On the other hand, staff cannot conclusively find that one alternative is better than the other. Therefore, our proposal is to pursue implementation of improvements that represent a step toward attaining the master planned vision.

- **Advance the Managed Lanes alternative, with one modification: shift the Tech Road station to the median. Without this modification, staff recommends removing the segment between Musgrove Road and Stewart Lane, as the benefits of this segment improvement would primarily serve auto travelers along the corridor.**
- **Continue to advance the master-planned vision for dedicated bus lanes on the entire corridor between the Silver Spring Transit Center and Burtonsville.** While the Managed Lanes alternative improves transit operations along the corridor, it is an interim step towards fully realizing the master-planned alignment.

INTERSECTION IMPROVEMENTS

This section of the staff report describes and evaluates six intersection improvements identified in the study and provides staff recommendations.

Description

Based on forecasted congestion, the study recommends six intersection improvements to reduce vehicle delay along the corridor. Asterisks (*) indicate a master-planned improvement.

- **US 29 at Greencastle Road**
 - Add an eastbound right-turn lane
 - Add second southbound left-turn lane and eastbound receiving lane
 - Cost: \$4-5 million



- **US 29 at Tech Road**
 - Add second southbound left-turn lane*
 - Widen the westbound approach to provide additional right-turn lane*
 - Cost: \$2-3 million



- **US 29 at Stewart Lane**
 - Add a second southbound left-turn lane*
 - Cost: \$2-3 million



- **US 29 at MD 650 (New Hampshire Avenue)**
 - Widen US 29 within the MD 650 interchange to provide three continuous southbound through lanes*
 - Cost: \$6-7 million



- **US 29 at I-495**

- Designate a second exit lane onto the ramp from southbound US 29 to westbound I-495 (Outer Loop)
- Revise pavement markings to create an extended acceleration lane for southbound US 29 to westbound I-495 entering traffic, or implement hard running outside shoulder use during the AM peak period from the US 29 southbound on-ramp to the I-495 westbound off-ramp at Georgia Avenue
- Cost: \$2-3 million



- **Sligo Creek Parkway at US 29**

- Provide a second westbound through lane*
- \$Cost: \$3-4 million



Analysis

The six intersection improvements are evaluated in combination with the Managed Lanes alternative and the results are shown in the tables below. Four improvements are related to intersections (**Table 1**), while two improvements increase southbound capacity at interchanges (**Table 2**).

Table 1: Comparison of Intersection Level of Service for the No Action and Managed Lanes Alternatives (2025)

Intersection	AM		PM	
	No Action	Managed Lanes	No Action	Managed Lanes
US 29 & Greencastle Rd	F (163)	F (84)	F (172)	F (123)
US 29 & Tech Road	F (82)	D	F (113)	D
US 29 & Stewart Lane	B	A	E (64)	B
US 29 & Sligo Creek Parkway	F (152)	F (87)	F (196)	F (162)

Note: For LOS E and LOS F, intersection delay (in seconds) is shown in parentheses.

Table 2: Comparison of Southbound Arterial Level of Service for the No Action and Managed Lanes Alternatives (2025)

Interchange	AM		PM	
	No Action	Managed Lanes	No Action	Managed Lanes
US 29 & MD 650: Stewart Lane to Prelude Drive	F (6)	F (9)	A	A
US 29 & I-495: Lanark Way to I-495	E (18)	F (7)	F (6)	D

Note: For LOS E and LOS F, travel speed (in miles per hour) is shown in parentheses.

The proposed intersections reduce delay substantially at all four intersections MD 650 during both the AM and the PM peak periods. At MD 650, travel speeds increase during both the AM and PM peak period. At I-495, travel speeds decrease during the AM peak period, showing that conditions are made worse.

Some preliminary analysis (not included in the study) evaluated the intersection improvements against a 2040 No Action scenario, but there is no standalone analysis of the Managed Lanes alternative. While the preliminary analysis reveals the independent merit of the intersection improvements, it does not reveal how the intersection improvements interact with the Managed Lanes alternative. **Without a standalone Managed Lanes alternative analysis, it is not possible to determine the extent to which reductions in delay are a result of the managed lanes or the intersection improvements.**

While the purpose of this study is to improve mobility along the US 29 corridor, shorter travel times, efficiency, and reduced congestion are not the sole goals of our transportation system. Improvements to improve delay should not come at the expense of station access. Additionally, the Parks Department has indicated that an additional westbound lane on Sligo Creek Parkway would have significant park impacts and does not align with current M-NCPPC parkway management goals. If advanced, it is understood that all elements of this improvement may not be feasible to implement and that park impacts associated with this intersection improvement would require mitigation.

Adding a second exit lane onto the ramp from southbound US 29 to westbound I-495 would degrade pedestrian safety along the corridor. There is currently a one-lane unsignalized, marked crossing across the westbound on-ramp to I-495. Pedestrians wait for gaps in traffic, then cross when it is safe to do so. Adding a second westbound lane would require pedestrians to identify a gap in two lanes of traffic, creating a multiple-threat situation. This interchange is surrounded by residential development and adjacent to Montgomery Blair High School, one of the largest high schools in the county. The study acknowledges that this proposed improvement degrades safety, but it does address the increased risks. Additional consideration of pedestrian safety at this crossing is needed prior to advancing the proposed capacity improvement.

Master Plan Consistency

While the intersection improvements have not been independently evaluated, several improvements are consistent with the existing master plans for the area, specifically the White Oak Science Gateway LATR/LATIP (2019). The addition of a second southbound left-turn lane at both Stewart Lane and Tech Road is consistent with the projects in the master plan, as is the addition of a westbound right-turn lane on Tech Road at US 29. Providing three continuous southbound lanes on US 29 through the MD 650 interchange is also included in the White Oak Science Gateway LATR/LATIP. In addition, widening Sligo Creek Parkway to accommodate another through lane is included in the North and West Silver Spring Master Plan (2000).

However, several intersection improvements in the White Oak Science Gateway LATR/LATIP and along the US 29 corridor are not included in this study, specifically the planned improvements at MD 650 and Lockwood Drive, US 29 at Cherry Hill Road/Randolph Road, and US 29 at Industrial Parkway. In addition, the Stewart Lane and Tech Road improvements at US 29 include additional intersection modifications beyond those included in the study. These modifications should be considered as the project moves into facility planning.

Finally, multiple proposed intersection improvements are not included in existing master plans, specifically those at Greencastle Road and I-495.

Recommendations

- **Do not move forward with adding a second ramp to westbound I-495 prior to evaluating and resolving the pedestrian safety issues associated with the project.**

BICYCLE AND PEDESTRIAN IMPROVEMENTS

The success of any transit project is related to the quality of the walking and bicycling environment connecting to the transit stations. As with any project that is proposing modest interim improvements, there is a balance to be had between the costs and benefits of expanding the project scope to include access improvements.

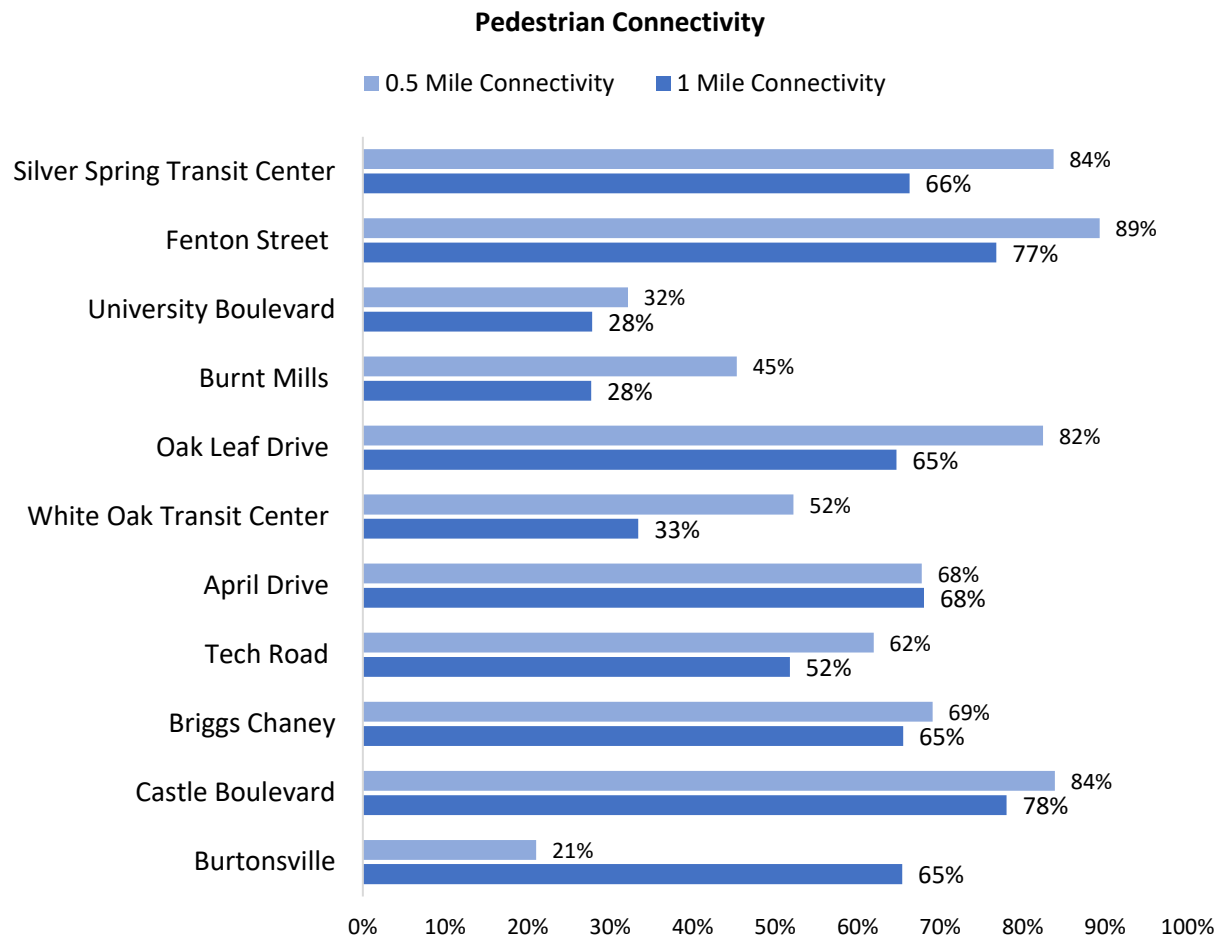
Description

The study evaluates existing FLASH station accessibility and Appendix III (**Attachment F**) includes over 200 recommended station access improvements. The evaluation and improvements cover the stations between Silver Spring and Tech Road. Many improvements are drawn from existing plans, including the Bicycle Master Plan, the Purple Line Functional Plan, the Countywide Transit Corridors Functional Master Plan, the Four Corners Master Plan, the White Oak Science Gateway Master Plan, and the Silver Spring CBD BiPPA Program.

Analysis

The Planning Department developed and maintains a bicycle Level of Traffic Stress (LTS) tool and is in the process of developing a Pedestrian Level of Comfort (PLOC) tool. These tools map the bicycle and pedestrian environment and can be used to understand access to destinations based on the comfort and safety of that environment.

The following page summarizes pedestrian connectivity² within 0.5 miles and 1 mile of the planned US 29 FLASH stations. The pedestrian environment varies dramatically along the corridor, with some stations topping 80% connectivity (Silver Spring Transit Center, Fenton Street, Oak Leaf Drive, and Castle Boulevard) and others with less than 40% connectivity (University Boulevard and Burtonsville).



Additional analyses could be completed for the existing bicycle environment. The Planning Department is also able to evaluate how proposed improvements would impact pedestrian and bicyclist comfort within the station area, as mentioned in the third recommendation below.

² For the purpose of this analysis, pedestrian connectivity is defined as the percentage of all residential trips to a station that meet a certain comfort threshold. In this case, the comfort threshold is set as “somewhat comfortable”, meaning the total comfortable distance only includes pedestrian segments with Pedestrian Level of Comfort scores of “very comfortable” or “somewhat comfortable”.

Recommendations

- **Evaluate station access and recommend bicycle and pedestrian improvements for the Briggs Chaney, Castle Boulevard, and Burtonsville station areas.** The study only evaluates existing FLASH station accessibility and makes station access improvement recommendations at 8 of the 11 FLASH stations, excluding Briggs Chaney, Castle Boulevard, and Burtonsville. The scope does not specify that only some stations should be evaluated, and these stations warrant evaluation. In the Mandatory Referral for the 65% design of the US 29 FLASH, the Planning Board recommended sidewalks on National Drive between the Burtonsville Park-and-Ride station and Burtonsville Town Center and one-way separated bike lanes on Castle Boulevard between Briggs Chaney Road and Castle Boulevard.

In addition, the Briggs Chaney and Castle Boulevard stations are located within Equity Emphasis Areas (as defined by the Metropolitan Washington Council of Governments). While other stations along the corridor are also Equity Emphasis Areas, excluding these stations is a disservice to the marginalized communities in the county.

- **Provide a complete cost estimate for all bicycle and pedestrian projects identified in this study as well as the cost estimate of projects to be identified in the Briggs Chaney, Castle Boulevard, and Burtonsville station areas.** The study estimates that the total cost for implementing the proposed station access improvements is \$20 million. However, the estimate excludes all improvements that are sidepaths or bridges, given the high cost of these types of infrastructure. The study's recommendations and appendix should clearly highlight which specific improvements are and are not recommended for construction and included in the \$20 million cost estimate.
- **In conjunction with the Planning Department, evaluate the pedestrian improvements identified in this study and the projects to be identified in the Briggs Chaney, Castle Boulevard, and Burtonsville station areas to determine the most critical and cost-effective projects that would improve station access. Prioritize bicycle projects based on the prioritization put forth in the Bicycle Master Plan. Prioritize pedestrian projects using the department's Pedestrian Level of Comfort (PLOC) tool.** The Planning Department has the capacity and the ability to complete this prioritization analysis on behalf of the Department of Transportation.

MASTER PLAN CONSISTENCY

The study is generally consistent with the recommendations in the Master Plan of Highways and Transitways (2018), the Countywide Transit Corridors Functional Master Plan (2013), the Silver Spring CBD Sector Plan (2000), the North and West Silver Spring Master Plan (2000), the Four Corners Master Plan (1996), the White Oak Science Gateway Master Plan (2014), the White Oak Master Plan (1997), the Fairland Master Plan (1997), and the Burtonsville Crossroads Neighborhood Plan (2012).

PARKS

The study corridor crosses three Stream Valley Parks (SVPs):

- Sligo Creek Stream Valley Park (Units 2 and 3)

- Northwest Branch Stream Valley Park (Units 3 and 4)
- Paint Branch Stream Valley Park (Units 4 and 5)

Other M-NCPPC Parks within the Study Corridor (within 200 feet of pavement) include:

- Calverton NCA
- Stonehedge LP
- Hasting NCA
- Ellsworth UP
- Gene Lynch UP
- Silver Spring Transit Center Plaza UP
- Burnt Mills East SP
- Burnt Mills West SP

In addition, one existing hard surface park trail and two natural surface park trails (one existing, one proposed) cross US 29:

- **Hard Surface:** Sligo Creek Trail, at grade and signalized, at Sligo Creek Parkway
- **Natural Surface:** Northwest Branch Trail/Rachel Carson Greenway Trail (uncontrolled); Paint Branch Trail (proposed) under the US 29 bridge over Paint Branch stream.

The following streams on parkland pass under U.S. 29:

- **Sligo Creek:** Use Class I - non-tidal stream
- **Northwest Branch:** Use Class IV - recreational trout waters
- **Paint Branch:** Use Class III - on-tidal cold water, naturally reproducing trout stream

The Northwest Branch Stream Valley Units are considered a Best Natural Area and the Paint Branch Stream Valley Units are considered a Biodiversity Area. These designations require special consideration and mitigation for all proposed impacts to the sensitive natural resources within these park areas.

Corridor improvements will likely impact at least one of the above parks and will have impacts to the streams. At the time of more detailed planning and design for the selected improvements, Montgomery Parks will provide detailed comments, including opportunities to improve trail connections, protect natural resources, and to improve stormwater discharge into streams on parkland. Further detail regarding Park priorities and concerns are found in the detailed comments in **Attachment G**.

Recommendations

- **Montgomery Parks staff should be included in any interagency coordination meetings regarding more detailed design of the proposed improvements.** In addition, any proposed design and work on parkland will require completing the Concept Review Process and receiving a Park Construction Permit.

PUBLIC OUTREACH

Throughout the study, public engagement was performed to solicit input on transportation issues and concerns, existing condition data, alternatives to be evaluated and draft recommendations. Meetings with the US 29 South, Central and North US 29 Corridor Advisory Committee were held in May and June 2018, an existing conditions public open house meeting in White Oak was held in November 2018 and a draft recommendations virtual public open house was held in July 2020. Additional recurring

stakeholder coordination occurred with the Maryland DOT State Highway Administration, the Planning Department, and County Council/ Executive.

CONCLUSION

The US 29 Mobility & Reliability Study evaluates transit alternatives for the corridor, intersection improvements to reduce delay, and bicycle and pedestrian projects to improve station access. While staff believes the incomplete analysis conducted in this study prevents making a fully-informed recommendation regarding a transit alternative, intersection improvements or bicycle and pedestrian improvements, we do believe that it is possible to move forward with the Managed Lanes alternative with modifications, as this represents a step toward fulfilling the master planned vision for the corridor. Staff therefore recommends transmitting the following comments to the Montgomery County Department of Transportation (MCDOT) and the County Council's Transportation Energy and Environment (T&E) Committee:

- Advance the Managed Lanes alternative, with one modification: shift the Tech Road station to the median. Without this modification, staff recommends removing the segment between Musgrove Road and Stewart Lane, as the benefits of this segment improvement would primarily serve auto travelers along the corridor.
- Continue to advance the master-planned vision for dedicated bus lanes on the entire corridor between the Silver Spring Transit Center and Burtonsville. While the Managed Lanes alternative improves transit operations along the corridor, it is an interim step towards fully realizing the master-planned facility.
- Do not move forward with adding a second ramp to westbound I-495 prior to evaluating and resolving the pedestrian safety issues associated with the project.
- Evaluate station access and recommend bicycle and pedestrian improvements for the Briggs Chaney, Castle Boulevard, and Burtonsville station areas.
- Provide a complete cost estimate for all bicycle and pedestrian projects identified in this study as well as the cost estimate of projects to be identified in the Briggs Chaney, Castle Boulevard, and Burtonsville station areas.
- In conjunction with the Planning Department, evaluate the pedestrian improvements identified in this study and the projects to be identified in the Briggs Chaney, Castle Boulevard, and Burtonsville station areas to determine the most critical and cost-effective projects that would improve station access. Prioritize bicycle projects based on the prioritization put forth in the Bicycle Master Plan. Prioritize pedestrian projects using the department's Pedestrian Level of Comfort (PLOC) tool.
- Montgomery Parks staff should be included in any interagency coordination meetings regarding more detailed design of the proposed improvements.

ATTACHMENTS

- A. US 29 Mobility & Reliability Study
- B. Staff Report for 65% Design for the US 29 Bus Rapid Transit Project (MR2018038, July 2018)
- C. Staff Report for Draft US 29 Bus Rapid Transit Corridor Study (February 2017)

Greater Colesville Citizens Association

PO Box 4087
January 18, 2021

County Council T&E Committee
Attn: Tom Hucker, Chair
100 Maryland Ave

Re: US 29 BRT Reliability Study

Dear T&E Committee Member

The Greater Colesville Citizens Association (GCCA) has been a strong supporter of BRT in general and especially the three BRT corridors that transverse eastern Montgomery County (US-29, New Hampshire, and Randolph). We thank the county for implementing the first BRT corridor along US29. However, it needs to be modified so that the BRT vehicles do not operate in mixed traffic south of Tech Rd. The design needs to be changed to either have a dedicated lane or share a lane with other HOV vehicles so that the lane does not experience congestion. We thank the council for funding the US29 reliability study to develop such a solution.

We have reviewed the reliability study in detail and concluded that both alternatives as presented are unacceptable and neither should be funded for design in their current form. Neither of them achieves the intended purpose and each costs much more than necessary. We proposed changes to the design for both alternatives to address their shortcomings and substantially reduce cost.

Unless DOT is able to explain how the managed lane alternative is viable, that alternative should be eliminated (which is the one they are proposing). The name is somewhat misleading in that only the section south of Sligo Creek Pkwy uses managed lane concepts. The study proposes that a lane in the section between University Blvd and New Hampshire Ave be repurposed. It will convert one of the three thru lanes into a BRT-only lane in the peak direction, leaving only two thru lanes. The study then contends that congestion will be much less for the two remaining lanes than currently with three thru lanes. I have asked DOT several times to explain how this is possible and all they say is that this is what the computer modeling indicates. I am a firm believer in using computer models, but one must always ask whether the result is reasonable and passes the laugh test. When it fails that test, the inputs to computer must be reevaluated and changed. We don't think it is possible to eliminate a lane without substantially increasing congestion in the remaining thru lanes. This segment is already the most congested part of US 29 with stop and go conditions (more stopped than go) in the peak direction for 4 hours or so twice a day. Even if the county wanted to accept that additional congestion, the public would demand otherwise.

We prepared a presentation (attached) that compared the two study alternatives and then identified my proposal for fixing the problems (except for the repurpose issue). I had to make a few educated guesses, including the amount of space to accommodate my solution (e.g., width of existing bridge structure over Paint Branch.) I requested that DOT, the Planning staff and citizens (Smoot and myself) work together to develop a more realistic and cost effective solution. I estimate that the effort should take about three months to complete. This effort would not undertake normal traffic studies of future conditions. Rather, the effort is to finalize a way of achieving the purpose by simple changes in the configuration that take into account existing conditions, planned LATIP improvements, and future BRT corridors.

Until a viable solution has been developed and presented to the T&E Committee, it should not be funded for design. A viable solution must first be developed before undertaking the design.

You should understand that DOT has not involved the public in its design effort other a kick-off presentation telling us that they were going to do the study.

A properly designed BRT corridor on US29 is important to achieve the Thrive Montgomery 2050 and White Oak Science Gateway Master Plan visions. This redesign needs to be done sooner rather than later since Viva White Oak is on the verge of getting off the ground. (Since the passage of the Growth and Infrastructure Policy and relates changes to the impact taxes, GLDC has paid the county \$10M many years earlier than they would have otherwise.)

I urge you to ask DOT to form the proposed work group to develop an acceptable BRT solution and report back to the T&E Committee.

Sincerely,

Daniel L. Wilhelm,
GCCA President

Cc: DOT, Chris Conklin

MCDOT US29 Reliability Study

By Dan Wilhelm, 10/8/2020

- Study Primary Objective: develop solution for providing a dedicated BRT lane (not in mixed traffic) from Tech Road to SS Metrorail.
 - Study to include citizen proposal
- Study document
 - Poorly written: most explanations missing, conflicting info, hard to find key info
 - Bulk of space on other topics than primary one: previous studies, TDM, 16 pages for BRT station accessibility
- Six intersection improvements: \$16M-\$21M
 - Sligo Creek: maybe but minimal benefit
 - Beltway: ramp expansion provides no benefit since more vehicles can't access beltway
 - MD 650 (add third SB lane): rejected in 1990s as unsafe, could use for BRT only
 - Tech(add 2nd SB left turn): Many other changes needed, rather use LATIP/UMP
 - Stewart (2nd SB left turn): Needed but limited ROW doesn't allow proposed design
 - Greencastle (2nd SB left turn, E-W changes): needed to reduce delay, but not critical
- 200 bike and walking improvements from Bike MP:
 - \$15M-\$20M; actual cost at least 10 times that amount – address in CIP/LATIP
- Two BRT alternatives (22 pages):
 - Median (Emerson Smoot proposal+): \$106M, 9.8 acres for ROW: BRT only
 - Managed Lane: \$45M (\$40M Stewart-Musgrove). 2.2 acres, BRT+HOV

BRT Overview

- BRT (Flash) Implementation October 14, 2020
 - Two routes: 11 total stations, 5 on both routes
 - Burtonsville to SS only on US29: 6 stations
 - Briggs Chaney to SS on US29 and Stewart/Lockwood: 10 stations
 - Dedicated right shoulder north of Tech Rd and mixed traffic south.
- To be accepted must be low cost and provide dedicated BRT lane where congested. (major congestion between MD650 - MD193 and Sligo Creek-Spring Street)
- Study Global Issues
 - Didn't fully addresses existing conditions: MD193/Beltway, MD 650, Stewart
 - Unnecessary changes add cost and driver confusion: north of Tech Rd, Paint Branch Bridge, MD193 station, widening
 - Managed Lane provides dedicated lanes for half of MD650-MD193 segment, Travel time saving not justified with loss of lane (repurpose lane)
- Alternatives evaluated in five segments in subsequent charts
 - Provide solution for each study alternative ; issues identified in < >
 - Provide my preferred solution keeping both alternatives in middle segment

Burtonsville to Stewart Lane Segment

Median Alt (BRT)

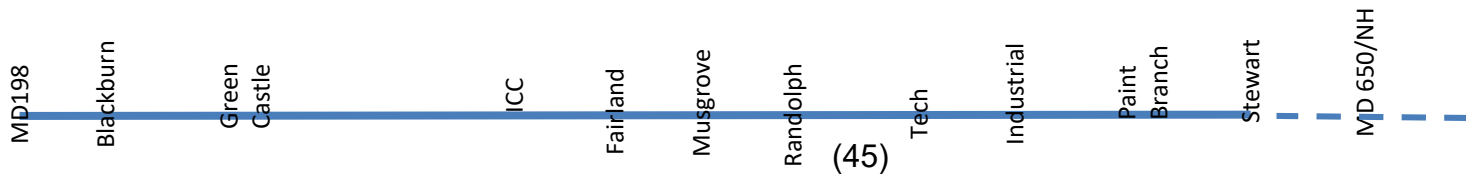
- 2 Tech Rd platforms unchanged (right side)
- Tech Rd north BRT on right shoulder
- 2 median lanes south < BRT to switch lanes>
- Widen Paint Branch Bridge in median <high cost>
- 10 ft side path on west south of Industrial Pkwy <poor location, needless expense>

Managed Lane Alt (BRT+HOV)

- 2 Tech Rd platforms unchanged
- 2 left BRT shoulder lanes from Blackburn Rd to Fairland Rd < must widen no cost, why change>
- BRT/HOV in left lane Musgrove to Stewart in perk period only - \$40M <why not full time>
- Switch mixed-use lane from Musgrove to use right shoulder during peak < confusing for drivers to switch lanes at certain times>
- <BRT switches: left lane-right platform-left lane>
- Widen bridge <high cost>
- No sidepath

Wilhelm Alt (BRT)

- 2 Tech Rd platforms unchanged
- Use right shoulder full length
- Restripe bridge to achieve 4 lanes
- No sidepath (use Old Columbia)
- May need to rebuild right shoulder (conflicting messages from DOT)
- (min cost and change)



Stewart Lane to Oak Leaf Dr Segment

Median Alt (BRT)

- 1 median BRT lane (from 2 north) <would need to widen MD650 intersection; rejected in 1990s as unsafe>
- Two 5 -10 ft sidewalks on both sides
- <does not address left turn congestion at Stewart for one route>
- <does not address large number of turns at MD650>

Managed Lane Alt (BRT+HOV)

- Repurpose one lane in median from Stewart in peak direction during peak period - 2 mixed-use lanes from 3 < doesn't explain how mixed traffic less congested; would need to widen MD650 intersection, rejected in 1990s due to safety)
- 2 sidewalks/side path
- <does not address left turn congestion at Stewart for one route>
- <does not address large number of turns at MD650>

Wilhelm Alt (BRT)

- BRT on right with right turning traffic
- 2nd SB left lane at Stewart via shift of mixed use lanes southbound
- Add 3rd lane southbound between two ramps at MD 650 (BRT only, avoids safety issue)
- No sidewalk/sidepath north MD 650 (Use Old Columbia)



Oak Leaf Dr to Timberwood Ave Segment

Median Alt (BRT)

- 1 median BRT lane <2 lanes at station in one diagram>
- Change left-turn signals
- Station moved to median at Lockwood intersection < BRT turning and conflicts to serve Burtonsville not clear; no available SB from WO>
- Expand sidewalk and add where needed (14-24 ft total) <very costly and requires property taking>

Managed Lane Alt (BRT+HOV)

- Repurpose one lane in median to Southwood Ave in AM peak and from Burnt Mills Ave to Prelude in PM peak< less congestion not explained/justified; why not all day>
- Move Burnt Mills Station to median \$12.4M <cost more than \$1.2M to move stone wall back>
- Add 2nd sidewalk where needed or sidepath on each side between intersections < very costly, requires property taking>

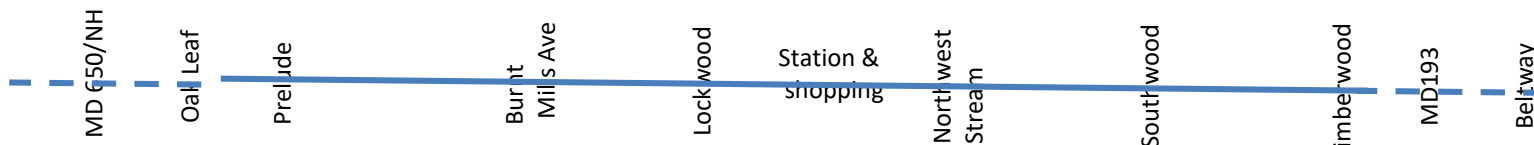
Wilhelm Alt (BRT+HOV)

A: **Median**

- Study design but no change to sidewalks, use BRT vehicle for bikes
 - Station Location still an issue
(reduced cost)
-

B. **Managed (If DOT can justify repurposing)**

- Repurpose one lane on right from Oak Leaf to Timberwood, both directions
- BRT station not changed
- No change in sidewalks. Use BRT for bikes
(minimal cost, largely signs)



Timberwood Ave to Sligo Creek Segment

Median Alt (BRT)

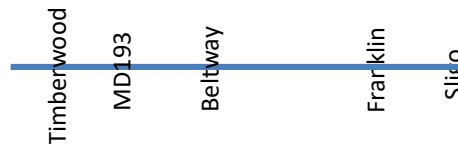
- 2 median lanes to beltway <limited congestion, except to access beltway>
- 1 median lane south of beltway <limited congested>
- Four Corners station moved to median <more people crossing the street, cost at \$7.2M*>
- Removes extra mixed-use traffic lanes, 6 total <backup traffic to beltway; even more congestion both ways>

Managed Lane Alt (BRT+HOV)

- Mixed Traffic, shift northbound lanes at HS.
- Southbound station moved to median at \$7.2M*. Northbound station moved back toward HS <No rationale for change, different location from Median alt, cost>

Wilhelm Alt (BRT+HOV)

- Mixed Traffic, little congestion in this section other than to access beltway
- No change to station (no cost)



(48)

* Not clear which alternative cost for

Sligo Creek to Spring Street Segment

Median Alt (BRT)

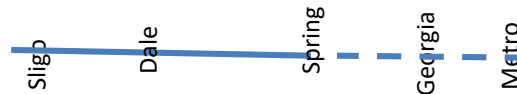
- Mixed traffic

Managed Lane Alt (BRT+HOV)

- Convert left of four lanes to BRT during peak period

Wilhelm Alt (BRT+HOV)

- Use Managed Lane Alternative, but use right lane.



Conclusion

- Oppose both MCDOT Draft Study Alternatives as presented
- Alternative(s) to fixing study design
 - Single solution for four segments
 - Two alternatives for middle segment
 - Depends upon whether repurposing can be justified
- Recommendation: DOT should work with Smoot, Wilhelm, Planning to fix before being presented to the Council



US 29 Managed Lane Project

(P502201)

Category	Transportation	Date Last Modified	12/23/20
SubCategory	Roads	Administering Agency	Transportation
Planning Area	Kemp Mill-Four Corners and Vicinity	Status	Preliminary Design Stage

EXPENDITURE SCHEDULE (\$000s)

Cost Elements	Total	Thru FY20	Rem FY20	Total 6 Years	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	Beyond 6 Years
Planning, Design and Supervision	6,000	-	-	6,000	-	3,000	3,000	-	-	-	-
TOTAL EXPENDITURES	6,000	-	-	6,000	-	3,000	3,000	-	-	-	-

FUNDING SCHEDULE (\$000s)

Funding Source	Total	Thru FY20	Rem FY20	Total 6 Years	FY 21	FY 22	FY 23	FY 24	FY 25	FY 26	Beyond 6 Years
G.O. Bonds	6,000	-	-	6,000	-	3,000	3,000	-	-	-	-
TOTAL FUNDING SOURCES	6,000	-	-	6,000	-	3,000	3,000	-	-	-	-

APPROPRIATION AND EXPENDITURE DATA (\$000s)

Appropriation FY 22 Request	3,000	Year First Appropriation	
Cumulative Appropriation	-	Last FY's Cost Estimate	-
Expenditure / Encumbrances	-		
Unencumbered Balance	-		

PROJECT DESCRIPTION

This project will design and implement a managed lane along the US 29 corridor from Musgrove Road to Southwood Drive and from Dale Drive to Spring Street. The managed lane will be restricted to use by high occupancy vehicles (HOV) and transit to improve roadway performance and person throughput. The project will also include improvements at identified "hot spot" locations to improve overall traffic operations along the US 29 corridor.

LOCATION

Master plans: Silver Spring, North and West Silver Spring, Four Corners, White Oak, White Oak Science Gateway, and Fairland. Route US 29 from Burtonsville to downtown Silver Spring.

ESTIMATED SCHEDULE

Project planning was completed in FY 20. Preliminary engineering would begin in FY 22 and be completed in FY 23.

PROJECT JUSTIFICATION

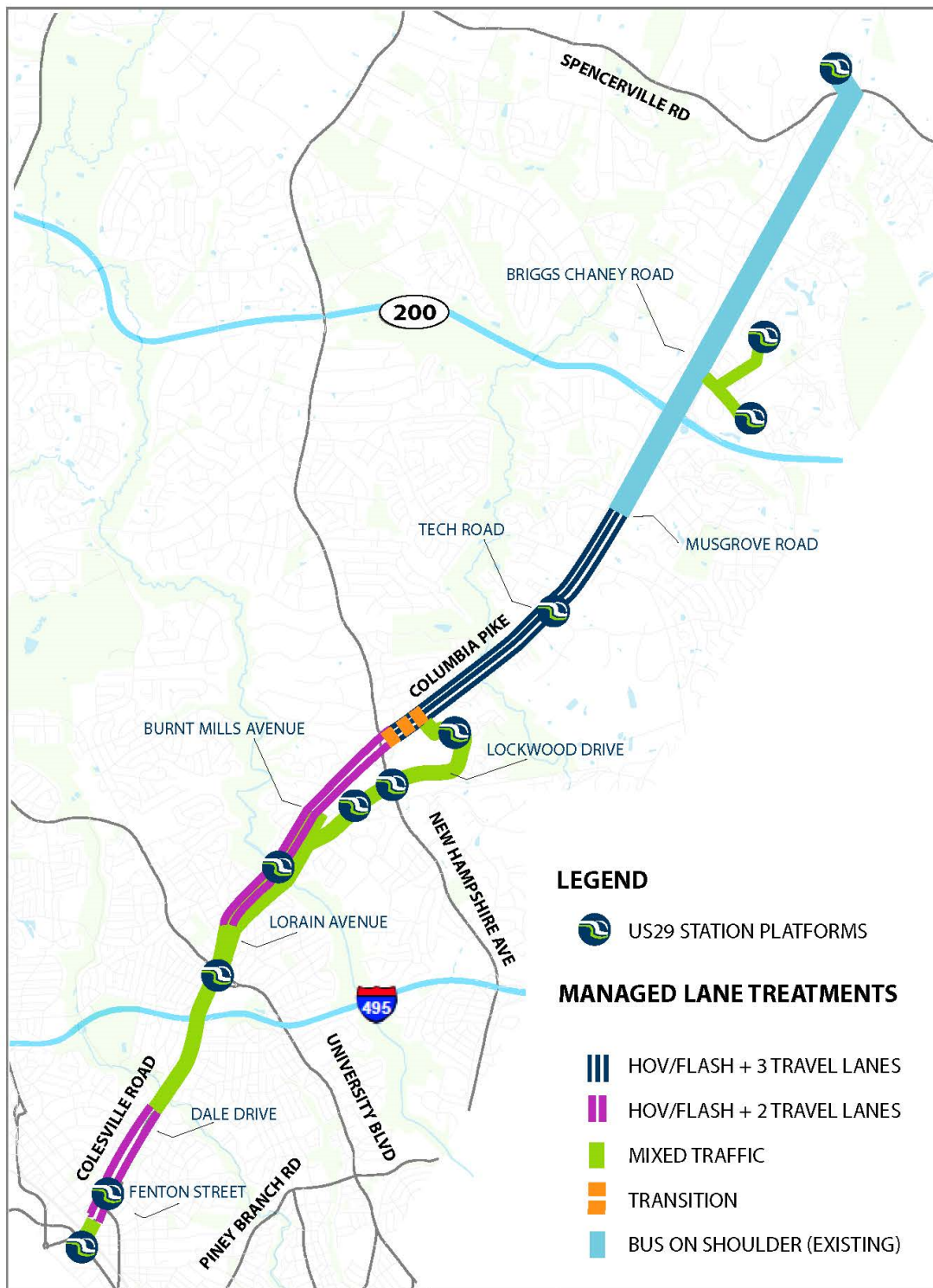
This project will complement the investment in US 29 Flash and improve transit, carpool, and overall corridor travel time and reliability, performance, and person throughput from MD 198 to the Silver Spring Transit Center. These efforts will support master plan non-auto-drive mode share (NADMS) goals. The project supports the following countywide vision goals: Easier Commutes and a Growing Economy. Approved land use plans in the corridor recommend the implementation of transit lanes along with US 29 Flash. The project is consistent with the Countywide Transit Corridors Functional Master Plan.

DISCLOSURES

A pedestrian impact analysis will be performed during design or is in progress.

COORDINATION

Maryland Department of Transportation, Washington Metropolitan Area Transit Authority, Maryland-National Capital Park and Planning Commission



US 29 - Station 1

Silver Spring Transit Center



BARRIERS TO PEDESTRIAN/BICYCLE CONNECTIVITY

Columbia Pike NB and SB Lanes between 2nd Avenue and East West Highway
Metrorail/MARC tracks

KEY RECOMMENDATION

- A Pedestrian bridge connecting Silver Spring Transit Center, MARC Station and Metrorail station (per Purple Line Functional Plan).
- B Address sidewalk on northwest side of US 29 between 2nd Avenue and Metrorail tracks, which are not compliant due to obstructions such as lampposts, and the stairs at the underpass.
- C Sharrow markings, "Bicycle May Use Full Lane" signage, and "Bicycle Route" signage on 2nd Avenue between Fenwick Lane and US 29 (per Bicycle and Pedestrian Priority Area Silver Spring CBD).
- D Add crosswalk and pedestrian signal at US 29 and North Noyes Drive.
- E Add crosswalk and pedestrian signal on north side of US 29 and Spring Street intersection.
- F Add pedestrian refuge medians on southwest and northwest legs of US 29 and Georgia Avenue intersection.
- G Add crosswalk to northeast leg of US 29 and Silver Spring Transit Center Entrance.
- H Continue bi-directional bike lane to Grubb Road.
- I Add 5 ft minimum sidewalks to Fairview Road between Spring Street and Noyes Drive.
- J Add 5 ft minimum sidewalks to Alton Parkway between Noyes Drive and Spring Woodland Drive.
- K Add 5 ft minimum sidewalks on Noyes Drive between Alton Parkway and US 29.

Below recommendations are from the Montgomery County Bicycle Master Plan:

- L Separated bike lanes (both sides) on US 29 from 16th St to Wayne Ave
- M Separated Bike Lanes (Two-Way, East Side) on US 29 from Wayne Ave to Georgia Avenue
- N Separated Bike Lanes (Two-Way, North Side) on East West Highway from 16th St to Georgia Ave
- O Separated Bike Lanes (Two-Way, East Side) on 16th Street from DC to Georgia Avenue
- P Off-Street Trail (Metropolitan Branch Trail) on elevated structure from Fenton Street to S Springwood Drive
- Q Neighborhood Greenway / Shared Roadway on 2nd Ave from Spring St to 16th Street
- R Separated Bike Lanes (Side TBD) on 2nd Ave/ Wayne from Cedar Street to Spring Street
- S Neighborhood Greenway / Shared Roadway on Woodland Drive from Spring Street to Columbia Boulevard and Alton Parkway from Spring Street to Highland Drive
- T Separated Bike Lanes (Two-Way, West Side) on Fenton Street from King Street to Spring Street
- U Separated Bike Lanes (Side TBD) on Cameron Street from Spring Street to 2nd Avenue
- V Shared Street on Ellsworth Dr from Fenton Street to Georgia Avenue
- W Separated bike lanes (two-way, east side) on Ellsworth Drive from Spring Street to Bennington Road
- X Neighborhood Greenway / Shared Roadway on Ellsworth Drive from Spring Street to Bennington Road
- Y Neighborhood Greenway / Shared Roadway on Cedar Street from Wayne Street to Bonifant Street
- Z Neighborhood Greenway / Shared Roadway on Bonifant Street from Cedar Street to Grove Street
- AA Neighborhood Greenway / Shared Roadway on Grove Street from Bonifant Street to Sligo Avenue
- AB Enclosed Bicycle Parking Station at Silver Spring Transit Center
- AC Separated Bike Lanes (Side TBD) on 13th Ave/ Burlington Avenue from DC to Fenton Street
- AD Priority Shared Lane Markings / Shared Roadway on Philadelphia Ave / Gist Ave from Selim Road to Takoma Ave
- AE Neighborhood Greenway / Shared Roadway on Woodbury Drive (Dead end south of Sligo Ave) to Sligo Avenue
- AF Separated bike lanes (both sides) on Dixon Avenue from Wayne Avenue to Georgia Avenue
- AG Priority Shared Lane Markings/ Shared Roadway on Silver Spring Avenue from Georgia Avenue to Fenton Street

Legend

- Half Mile Station Buffer
- Half Mile Walkshed
- Proposed BRT Platform
- Proposed Improvements from the Montgomery County Bicycle Master Plan
- Recommended Pedestrian/Linear Improvements
- Recommended Area Improvements
- Barriers to Bicycle and Pedestrian Connectivity
- Existing Sidewalk

US 29 - Station 2

Fenton Street



BARRIERS TO PEDESTRIAN/BICYCLE CONNECTIVITY

Columbia Pike NB and SB Lanes north of Dale Drive and between 2nd Avenue and East West Highway
Metrorail/MARC tracks

KEY RECOMMENDATION

- A 10 ft wide pedestrian bridge connecting Silver Spring Transit Center, MARC Station and Metrorail station (per Purple Line Functional Plan).
- B Address sidewalk on northwest side of US 29 between 2nd Avenue and Metrorail tracks, which are not compliant due to obstructions such as lampposts, and the stairs at the underpass.
- C Sharrow markings, "Bicycle May Use Full Lane" signage, and "Bicycle Route" signage on 2nd Avenue between Fenwick Lane and US 29 (per Bicycle and Pedestrian Priority Area Silver Spring CBD).
- D Improve pedestrian space and adding bus stop amenities such as shelter and bus arrival information (NB already has shelter at location).
- E Remove parking in order to accommodate BRT Platform.
- F Include bike racks at BRT Station.
- G Add pedestrian refuge medians on southwest and northwest legs of US 29 and Georgia Avenue intersection.
- H Add crosswalk and pedestrian signal on north side of US 29 and Spring Street intersection.
- I Add crosswalk and pedestrian signal at US 29 and North Noyes Drive.
- J Extend sidewalks on Dale Drive further to the West to connect to Georgia Avenue.
- K Widen sidewalks on both sides of US 29 for a minimum of 6 ft between Spring Street and Dale Drive. Add ADA compliant crossings of side streets.
- L Add 5 ft minimum sidewalks on Noyes Drive between Alton Parkway and US 29.
- M Add 5 ft minimum sidewalks to Fairview Road between Spring Street and Noyes Drive.
- N Add 5 ft minimum sidewalks to sections of Alton Parkway that are open to traffic. Widen shared-use path sections (south of Noyes Drive, north of Highland Drive) to 10 ft.

Below recommendations are from the Montgomery County Bicycle Master Plan:

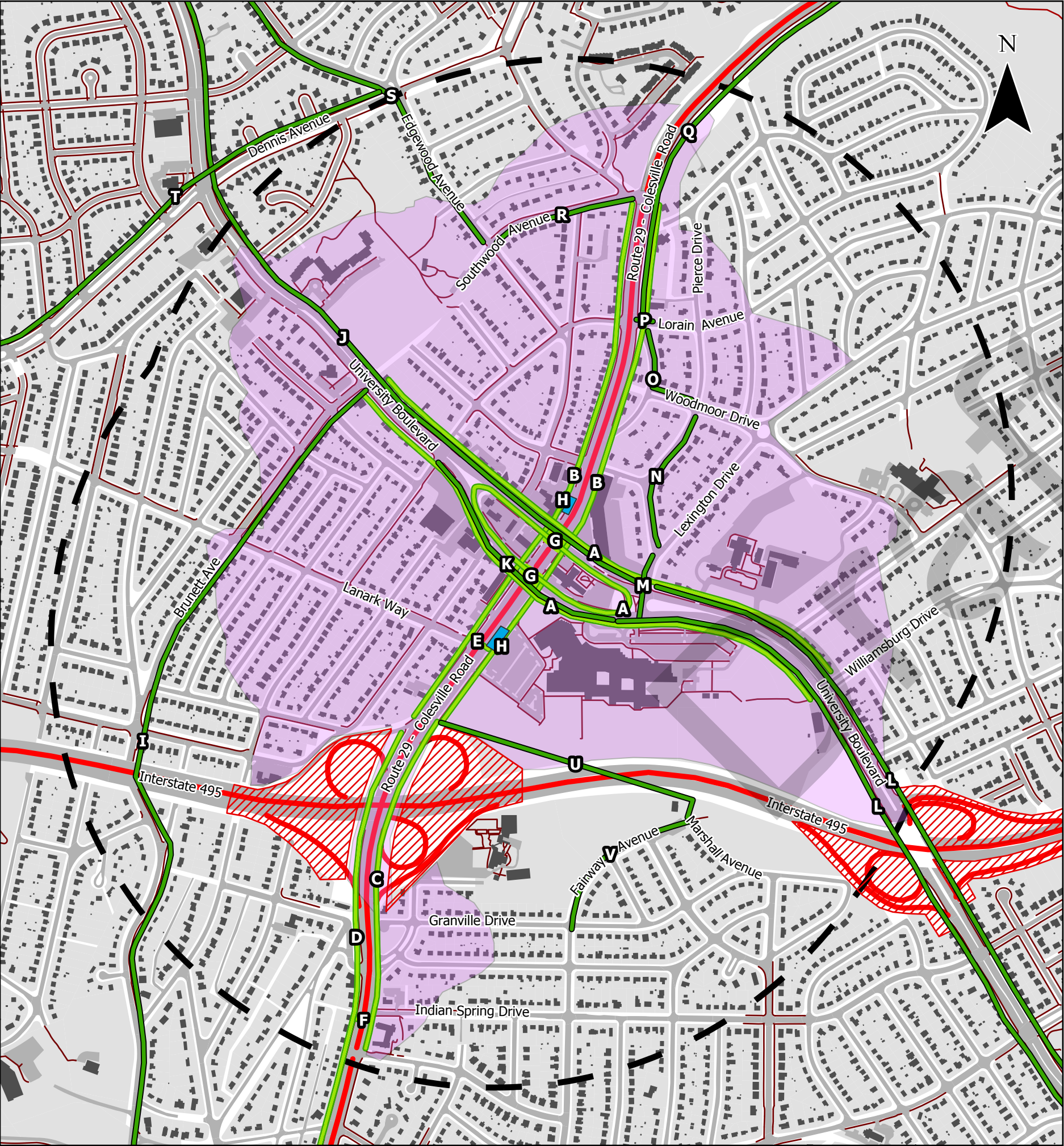
- O Separated bike lanes (both sides) on US 29 from 16th St to Wayne Ave
- P Separated Bike Lanes (Two-Way, East Side) on US 29 from Wayne Ave to Georgia Avenue
- Q Separated Bike Lanes (Two-Way, North Side) on East West Highway from 16th St to Georgia Ave
- R Separated Bike Lanes (Two-Way, East Side) on 16th Street from DC to Georgia Avenue
- S Off-Street Trail (Metropolitan Branch Trail) on elevated structure from Fenton Street to S Springwood Drive
- T Neighborhood Greenway / Shared Roadway on 2nd Ave from Spring St to 16th St
- U Separated Bike Lanes (Side TBD) on 2nd Ave/ Wayne from Cedar Street to Spring Street
- V Neighborhood Greenway / Shared Roadway on Woodland Drive from Spring Street to Columbia Boulevard and Alton Parkway from Spring Street to Highland Drive
- W Separated Bike Lanes (Two-Way, West Side) on Fenton Street from King Street to Spring Street
- X Separated Bike Lanes (Side TBD) on Cameron Street from Spring Street to 2nd Avenue
- Y Shared Street on Ellsworth Dr from Fenton Street to Georgia Avenue
- Z Separated bike lanes (two-way, east side) on Ellsworth Drive from Spring Street to Fenton Drive
- AA Neighborhood Greenway / Shared Roadway on Ellsworth Drive from Spring Street to Bennington Road
- AB Neighborhood Greenway / Shared Roadway on Cedar Street from Wayne Street to Bonifant Street
- AC Neighborhood Greenway / Shared Roadway on Bonifant Street from Cedar Street to Grove Street
- AD Neighborhood Greenway / Shared Roadway on Grove Street from Bonifant Street to Sligo Avenue
- AE Separated bike lanes (both sides) on Dixon Avenue from Wayne Avenue to Georgia Avenue
- AF Priority Shared Lane Markings/ Shared Roadway on Silver Spring Avenue from Georgia Avenue to Fenton Street

Legend

- Half Mile Station Buffer
- Half Mile Walkshed
- Proposed BRT Platform
- Proposed Improvements from the Montgomery County Bicycle Master Plan
- Recommended Pedestrian/Linear Improvements
- Recommended Area Improvements
- Barriers to Bicycle and Pedestrian Connectivity
- Existing Sidewalk

US 29 - Station 3

University Boulevard



BARRIERS TO PEDESTRIAN/BICYCLE CONNECTIVITY

- Columbia Pike NB and SB Lanes
- All I-495 Ramps
- I-495 EB and WB Lanes

KEY RECOMMENDATION

- A Widen sidewalks on University Boulevard to a minimum of 6 ft from Brunett Avenue to Williamsburg Drive.
- B Widen sidewalks on US 29 to a minimum of 6 ft from I-495 ramps to Southwood Avenue (per Four Corners Master Plan and Countywide Transit Corridors Functional Master Plan).
- C Install new bike bridge over I-495 on US 29.
- D Widen sidewalks on west side of US 29 to a minimum of 5 ft from I-495 to Sligo Creek Parkway (per Four Corners Master Plan).
- E Accommodate a pedestrian refuge median for safe road crossing at BRT Station (US 29 and Lanark Way) and add pedestrian-activated signal (HAWK or RRFB).
- F Add pedestrian-activated signal (HAWK or RRFB) at existing crosswalk at US 29 and Indian Spring Drive.
- G Consider deployment of Capital Bikeshare in Four Corners and White Oak, due to proximity to existing stations in Silver Spring and Wheaton.
- H Include bike racks at BRT station platforms.

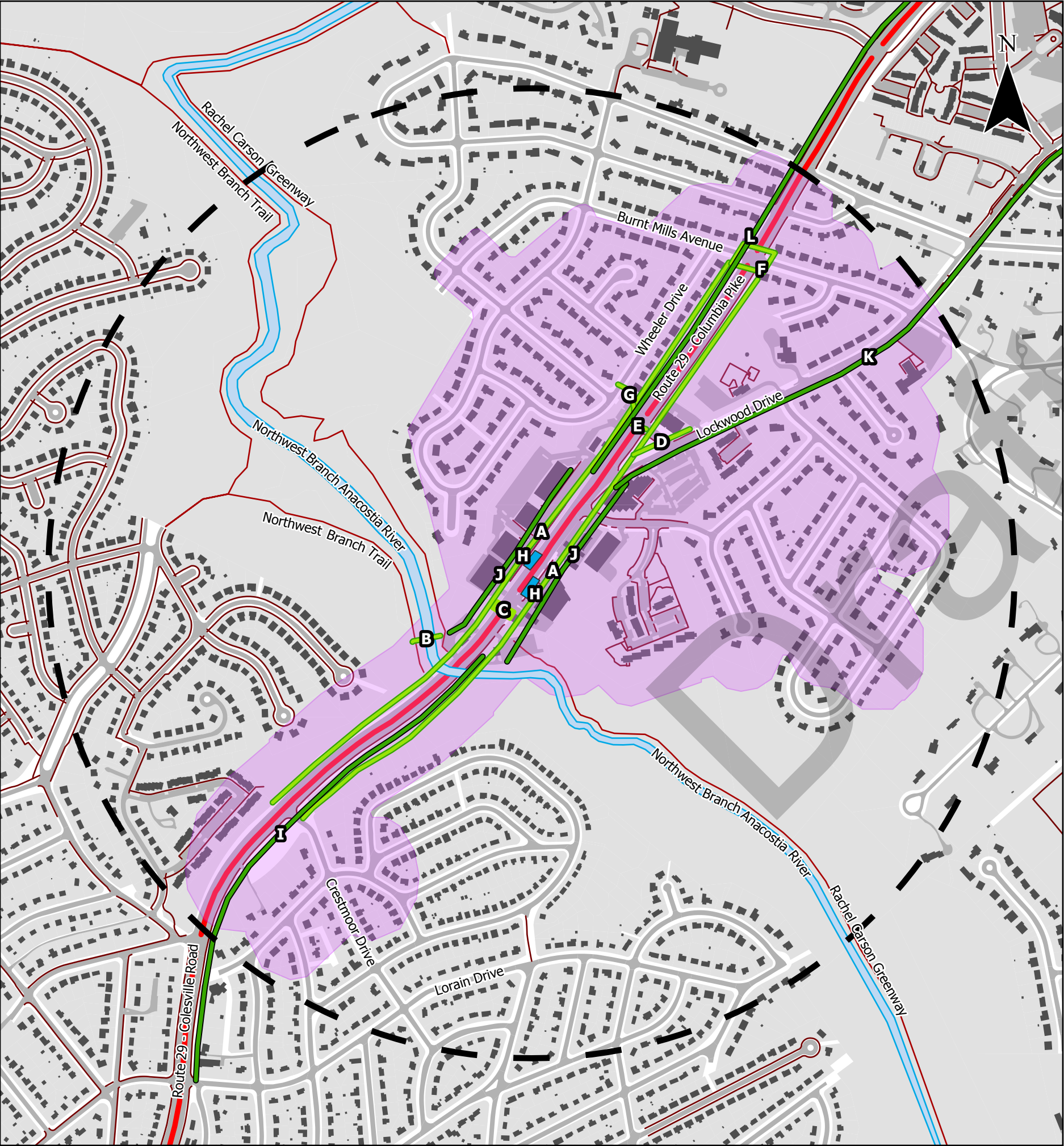
Below recommendations are from the Montgomery County Bicycle Master Plan:

- I Neighborhood Greenway / Shared Roadway on Brunett Avenue from University Boulevard to Sligo Creek Parkway
- J Separated Bikeways (Sidepath, East Side) on University Boulevard from Lexington Drive to Reedie Drive
- K Separated Bikeways (Sidepath, West Side) on University Boulevard from Lexington Drive to Lorain Avenue
- L Separated bike lanes (both sides) on University Boulevard from Lexington Drive to Langley Drive
- M Separated Bikeways (Sidepath, West Side) on Lexington Drive from Pierce Drive to University Boulevard
- N Neighborhood Greenway / Shared Roadway on Pierce Drive from Lexington Drive to Woodmoor Drive
- O Neighborhood Greenway / Shared Roadway on Woodmoor Drive and Woodmoor Circle from Pierce Drive to Lorain Avenue
- P Neighborhood Greenway / Shared Roadway on Lorain Avenue from Woodmoor Circle to US 29
- Q Separated Bikeways (Sidepath, East Side) on US 29 from Lorain Avenue to Rachel Carson Greenway
- R Neighborhood Greenway / Shared Roadway on Southwood Avenue from US 29 to Edgewood Avenue
- S Neighborhood Greenway / Shared Roadway on Edgewood Avenue from Southwood Avenue to Eisner Street
- T Separated Bikeways (Sidepath, North Side) on Dennis Avenue from Edgewood Avenue to Douglas Avenue
- U Pedestrian/ Bike bridge over I-495 from US 29 to Indian Spring Terrace Park
- V Neighborhood Greenway / Shared Roadway on Fairway Avenue from Marshall Avenue to Granville Drive

Legend

- Half Mile Station Buffer
- Half Mile Walkshed
- Proposed BRT Platform
- Proposed Improvements from the Montgomery County Bicycle Master Plan
- Recommended Pedestrian/Linear Improvements
- Recommended Area Improvements
- Barriers to Bicycle and Pedestrian Connectivity
- Existing Sidewalk

US 29 - Station 4 Burnt Mills



BARRIERS TO PEDESTRIAN/ BICYCLE CONNECTIVITY

Columbia Pike NB and SB Lanes
Northwest Branch

KEY RECOMMENDATION

- A Add 6 ft wide minimum sidewalks on both sides of US 29 from Crestmoor Drive to Burnt Mills Avenue (per Four Corners Master Plan and Countywide Transit Corridors Functional Master Plan).
 - B Add pedestrian bridge over Northwest branch connecting Burnt Mills West Special Park to Northwest Branch Trail.
 - C Widen median to accommodate pedestrian refuge for safe road crossing on north leg of US 29 and Holy Cross Health Entrance (per Countywide Bike Master Plan).
 - D Add minimum 6 ft sidewalks to west side of northbound Lockwood Drive.
 - E Add crosswalk and pedestrian signal to south leg of US 29 and southbound Lockwood Drive intersection.
 - F Add ADA compliant crosswalks to all four legs of US 29 and Burnt Mills Avenue intersection. Add refuge medians to north and south legs. Add pedestrian signal to south leg.
 - G Improve pedestrian path between Wheeler Drive and US 29 to make it ADA compliant.
 - H Include bike racks at BRT station platforms.
- Below recommendations are from the Montgomery County Bicycle Master Plan:
- I Separated Bikeways (Sidepath, East Side) on US 29 from Lorain Avenue to Rachel Carson Greenway including new bike bridge over Northwest Branch.
 - J Separated Bikeways (Sidepath, both sides of Road) on US 29 from Rachel Carson Greenway to Lockwood Drive
 - K Separated Bikeway (Sidepath, east side) on Lockwood Drive from New Hampshire Avenue to Columbia Pike
 - L Separated Bikeway (Sidepath, west side) on US 29 from Lockwood Drive to Tech Road

- Legend
- Half Mile Station Buffer
 - Half Mile Walkshed
 - Proposed BRT Platform
 - Proposed Improvements from the Montgomery County Bicycle Master Plan
 - Recommended Pedestrian/Linear Improvements
 - Recommended Area Improvements
 - Barriers to Bicycle and Pedestrian Connectivity
 - Existing Sidewalk

US 29 - Station 5

Oak Leaf Drive



BARRIERS TO PEDESTRIAN/ BICYCLE CONNECTIVITY

- Columbia Pike NB and SB Lanes
- All four ramps between Columbia Pike and New Hampshire Avenue
- Perimeter of White Oak Federal Research Facility (Accessible only for authorized persons)

KEY RECOMMENDATION

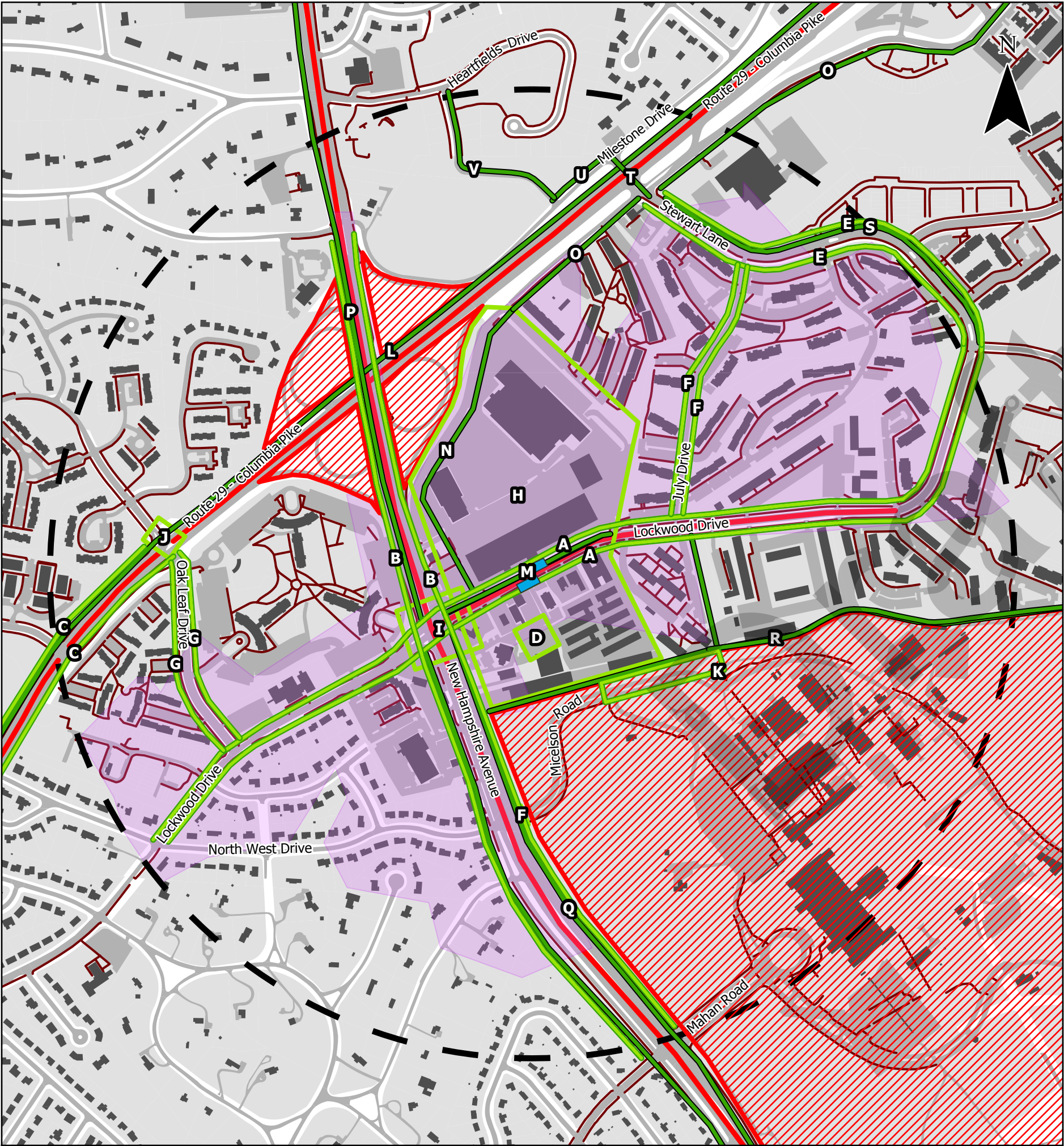
- A Add 6 ft wide minimum sidewalks on both sides of US 29 from Crestmoor Drive to Burnt Mills Avenue (per Four Corners Master Plan and Countywide Transit Corridors Functional Master Plan).
 - B Add 6 ft wide minimum sidewalks on both sides of Lockwood drive from US 29 to New Hampshire Avenue (per Countywide Transit Corridors Functional Master Plan).
 - C Add 5 ft wide minimum sidewalks on both sides of North West Drive from Childs Street to New Hampshire Avenue.
 - D Add ADA compliant crosswalks to all four legs of Lockwood Drive and North West Drive intersection. Reduce corner curb radii to slow turning vehicles and shorten crossing distances.
 - E Improve pedestrian crossing of New Hampshire Avenue and Lockwood Drive, with a focus on reducing curb radii to slow turning traffic and increasing size of pedestrian refuge medians.
 - F Enable pedestrian crossing at Oak Leaf Drive and US 29 through a redesign of the intersection.
 - G Improve pedestrian crossings at US 29 and Burnt Mills Drive. Add pedestrian signal to southern leg of intersection and add pedestrian refuge island to north and south legs of intersection. Add crosswalks to east and west legs.
 - H Add 5 ft wide minimum sidewalks on both sides of Burnt Mills Drive between US 29 and Lockwood Drive.
 - I Add bike storage at BRT station location.
 - J Add 5 ft wide minimum sidewalks on both sides of Oak Leaf Drive from US 29 to Lockwood Drive.
- Below recommendations are from the Montgomery County Bicycle Master Plan:
- K Separated bikeways (Sidepath, both sides) on US 29 from Rachel Carson Greenway to Lockwood Drive
 - L Separated Bikeway (Sidepath, west side) on US 29 from Lockwood Drive to Tech Road which would require new bridge over New Hampshire Avenue.
 - M Separated Bike Lanes (Two-Way, East Side) on Old Columbia Pike through White Oak Shopping Center
 - N Separated bikeway (Sidepath, west side) on New Hampshire Avenue from Lockwood Drive to Jackson Road
 - O Separated bikeway (Sidepath, both sides) on New Hampshire Avenue from Lockwood Drive to Oaklawn Drive
 - P Off-street Trail connecting Lockwood Drive and New Hampshire Avenue.
 - Q Separated Bikeway (Sidepath, east side) on Old Columbia Pike from White Oak Shopping Center to Stewart Lane
 - R Separated Bikeway (sidepath, east side) on Lockwood Drive from White Oak Park Drwy to New Hampshire Avenue

Legend

- Half Mile Station Buffer
- Half Mile Walkshed
- Proposed BRT Platform
- Proposed Improvements from the Montgomery County Bicycle Master Plan
- Recommended Pedestrian/Linear Improvements
- Recommended Area Improvements
- Barriers to Bicycle and Pedestrian Connectivity
- Existing Sidewalk

US 29 - Station 6

White Oak Transit Center



BARRIERS TO PEDESTRIAN/ BICYCLE CONNECTIVITY

- Columbia Pike NB and SB Lanes
- All four ramps between Columbia Pike and New Hampshire Avenue
- Perimeter of White Oak Research Facility (Accessible only for authorized persons)

KEY RECOMMENDATION

- A Add 6 ft wide minimum sidewalk on both sides of Lockwood Drive from North West Drive to Stewart Lane (per Countywide Transit Corridors Functional Master Plan).
- B Add 6 ft minimum sidewalks on both sides of New Hampshire Avenue from Milestone Drive to Mahan Drive.
- C Add 6 ft minimum sidewalks on both sides of US 29 from North West Drive to Oak Leaf Drive.
- D Accommodate bike storage by providing bike corrals at nearby parking lots.
- E Add 6 ft minimum sidewalk on both sides of Stewart Lane from US 29 to Lockwood Drive.
- F Add 5 ft minimum sidewalks on both sides of July Drive.
- G Add 5 ft minimum sidewalks on both sides of Oak Leaf Drive from US 29 to Lockwood Drive.
- H Implement redevelopment of shopping centers north and south of Lockwood Drive as envisioned in the White Oak Science Gateway Master Plan, featuring mixed-use development with street grid pattern.
- I Improve pedestrian crossing of New Hampshire Avenue and Lockwood Drive, with a focus on reducing curb radii to slow turning traffic and increasing size of pedestrian refuge medians.
- J Enable pedestrian crossing of US 29 at Oak Leaf Drive through redesign of the intersection.
- K Pedestrian/ bike access gate for White Oak Research Facility employees along fence line between Lockwood Drive and New Hampshire Avenue. Move to appropriate location once area between Lockwood Drive, New Hampshire Avenue and Michelson Road is redeveloped.

Below recommendations are from the Montgomery County Bicycle Master Plan:

- L Separated Bikeway (sidepath, west side) on US 29 from Lockwood Drive to Tech Road
- M Separated Bikeway (sidepath, east side) on Lockwood Drive from White Oak Park Drwy to New Hampshire Avenue
- N Separated Bike Lanes (Two-Way, East Side) on Old Columbia Pike through White Oak Shopping Center
- O Separated Bikeway (sidepath, east side) on Old Columbia Pike from White Oak Shopping Center to Tech Road
- P Separated bikeway (sidepath on west side) on New Hampshire Avenue from Lockwood Drive to Jackson Road
- Q Separated bikeway (sidepath on both sides of street) on New Hampshire Avenue from Lockwood Drive to Oaklawn Drive
- R Off-street Trail from New Hampshire Avenue to FDA Boulevard, with spur connecting to Lockwood Drive
- S Extend bike lanes on Stewart Lane to Old Columbia Pike
- T Create pedestrian/ bike crossing of US 29 on Stewart Lane in the form of a sidepath from Old Columbia Pike to Milestone Drive
- U Separated Bikeway (sidepath, west side) on Milestone Drive from Sherbrooke Woods Lane to Stewart Lane
- V Neighborhood Greenway / Shared Roadway on Sherbrooke Woods Lane from Milestone Drive to Heartfields Drive

Legend

- Half Mile Station Buffer
- Half Mile Walkshed
- Proposed BRT Platform
- Proposed Improvements from the Montgomery County Bicycle Master Plan
- Recommended Pedestrian/Linear Improvements
- Recommended Area Improvements
- Barriers to Bicycle and Pedestrian Connectivity
- Existing Sidewalk

US 29 - Station 7

Stewart Lane



BARRIERS TO PEDESTRIAN/BICYCLE CONNECTIVITY

Columbia Pike NB and SB Lanes
Perimeter of White Oak Federal Research Facility (Accessible only for authorized persons)

KEY RECOMMENDATION

- A Add 6 ft minimum sidewalk on both sides of Stewart Lane from US 29 to Lockwood Drive (per the Countywide Transit Corridors Functional Master Plan).
 - B Add 6 ft wide minimum sidewalk on both sides of Lockwood Drive from New Hampshire Avenue to Stewart Lane.
 - C Add 5 ft minimum sidewalks on both sides of July Drive.
 - D Include bike racks at BRT Station.
 - E Implement redevelopment of shopping centers north and south of Lockwood Drive as envisioned in the White Oak Science Gateway Master Plan, featuring mixed-use development with street grid pattern.
 - F Add 5 ft minimum sidewalk on east side of Old Columbia Pike from White Oak Shopping Center to Tree Top View Terrace.
 - G Improve sidewalk on west side of Milestone Drive from Eden Road to Sherbrooke Woods Lane.
 - H Create pedestrian path from Milestone Drive to Caplinger Road.
 - I Add 5 ft minimum sidewalk on April Lane.
 - J Create pedestrian path from Old Columbia Pike to April Lane.
- Below recommendations are from the Montgomery County Bicycle Master Plan:
- K Separated Bikeway (sidepath, east side) on Lockwood Drive from White Oak Park Drwy to New Hampshire Avenue
 - L Separated Bike Lanes (Two-Way, East Side) on Old Columbia Pike through White Oak Shopping Center
 - M Off-street Trail from New Hampshire Avenue to FDA Boulevard, with spur connecting to Lockwood Drive
 - N Extend bike lanes on Stewart Lane to Old Columbia Pike
 - O Separated Bikeway (sidepath, east side) on Old Columbia Pike from White Oak Shopping Center to Tech Road
 - P Separated Bikeway (sidepath, west side) on US 29 from Lockwood Drive to Tech Road
 - Q Create pedestrian/ bike crossing of US 29 on Stewart Lane in the form of a sidepath from Old Columbia Pike to Milestone Drive
 - R Separated Bikeway (sidepath, west side) on Milestone Drive from Sherbrooke Woods Lane to Stewart Lane
 - S Neighborhood Greenway / Shared Roadway on Sherbrooke Woods Lane from Milestone Drive to Heartfields Drive

Legend

- Half Mile Station Buffer
- Half Mile Walkshed
- Proposed BRT Platform
- Proposed Improvements from the Montgomery County Bicycle Master Plan
- Recommended Pedestrian/Linear Improvements
- Recommended Area Improvements
- Barriers to Bicycle and Pedestrian Connectivity
- Existing Sidewalk

US 29 - Station 8

Tech Road



BARRIERS TO PEDESTRIAN/BICYCLE CONNECTIVITY

- Columbia Pike NB and SB Lanes
- Tech Road westbound approach and Columbia Pike Intersection
- Industrial Parkway westbound approach and Columbia Pike Intersection

KEY RECOMMENDATION

- A Improve pedestrian space by widening sidewalk and adding bus stop amenities such as shelter and bus arrival information (per the Countywide Transit Corridors Functional Master Plan).
- B Improved pedestrian and bicycle accommodations on Columbia Pike crossing at Tech Road (pedestrian signals, crosswalks and raised refuge medians) (per the Countywide Transit Corridors Functional Master Plan).
- C Improve pedestrian crossing of Prosperity Drive, potentially combined with narrowing down Prosperity Drive.
- D Improve pedestrian crossing of Tech Road by adding a Pedestrian Signal.
- E Improve pedestrian space by widening sidewalk and adding bus stop amenities such as shelter and bus arrival information (potentially combining both stops).
- F Create safe pedestrian crossing on Prosperity Drive and Industrial Parkway (pedestrian signal, refuge median and improved crosswalks).
- G Expand Park and Ride, bringing the parking closer to BRT station by having a direct pedestrian connection to platform.
- H Narrow Prosperity Drive/ Old Columbia Pike between Industrial Parkway and Public Storage by converting SB lanes to pedestrian space and converting NB lanes to two 10' lanes (Would not be implemented with Recommendation J) (per the White Oak Science Gateway Master Plan).
- I Improved pedestrian and bicycle accommodations on Columbia Pike and Old Columbia Road crossing at Industrial Parkway (pedestrian signals, crosswalks and raised refuge medians) (per the Countywide Bike Master Plan).
- J Close Prosperity Drive north of Tech Road for 225' to create a large transit plaza between the NB platform to the shopping center (Would not be implemented with Recommendation H).
- K Implement street grid in White Oak Town Center plan with mixed use development (as shown in KLN Development Plan).
- L Designate a portion of retail parking for transit users during weekday commute times.
- M Coordinate with KLN to install bike corral with repair services amenities in planned fitness area.
- N Add bicycle storage at Park and Ride.
- O Add trail connection between Cedar Hill Drive and Paint Branch Road.
- P Add sidewalk to Old Columbia Pike between Industrial Parkway and Stonehedge Park.

Below recommendations are from the Montgomery County Bicycle Master Plan:

- Q Construct separated bikeway from Randolph Road on Old Columbia Pike (sidepath on west side) and Tech Road (one-way on both sides of street) to Columbia Pike.
- R Construct separated bikeway (one-way on both sides of street) on Tech Road from Columbia Pike to Industrial Parkway (per the Montgomery County Bicycle Master Plan and the White Oak Science Gateway Master Plan).
- S Construct separated bikeway (two-way on both sides of street) on Industrial Parkway from Columbia Pike to FDA Boulevard.
- T Construct separated bikeway (two-way, south side) on Broadbirch Drive from Tech Road to Cherry Hill (per the Montgomery County Bicycle Master Plan) OR add shared use path and signed shared roadway (per the White Oak Science Gateway Master Plan).
- U Construct separated bikeway on Old Columbia Pike/ Prosperity Drive (sidepath) from Randolph Road to Stewart Lane.
- V Construct separated bikeway (sidepath, west side) on Columbia Pike from Tech Road to Lockwood Drive.
- W Construct separated bikeway (two-way, south side) on Cherry Hill Road from Columbia Pike to Gracefield Road.
- X Construct separated bikeway (sidepath, west side) on Serpentine Way from Randolph Road to Fairland Road.

Legend

- Half Mile Station Buffer
- Half Mile Walkshed
- Proposed BRT Platform
- Proposed Improvements from the Montgomery County Bicycle Master Plan
- Recommended Pedestrian/Linear Improvements
- Recommended Area Improvements
- Barriers to Bicycle and Pedestrian Connectivity
- Existing Sidewalk