



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.
- 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.

BACKGROUND

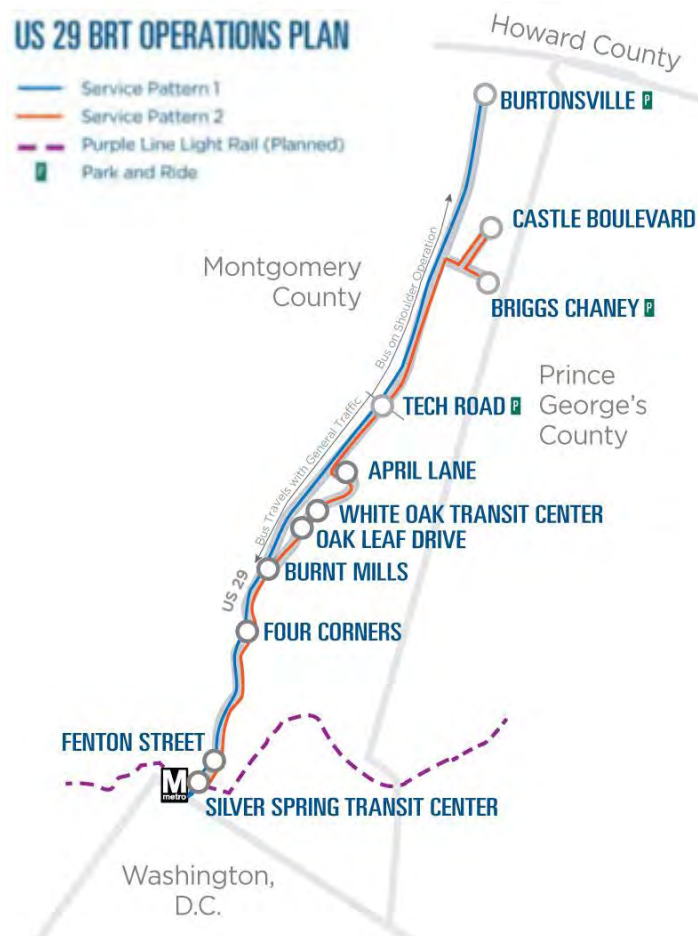
BRT is a high-quality and high-capacity bus-based transit system that delivers fast, comfortable, reliable and cost-effective transit service. It does this through the provision of dedicated transit lanes, branded stations and buses, off-board fare collection, real time information and fast and frequent 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.

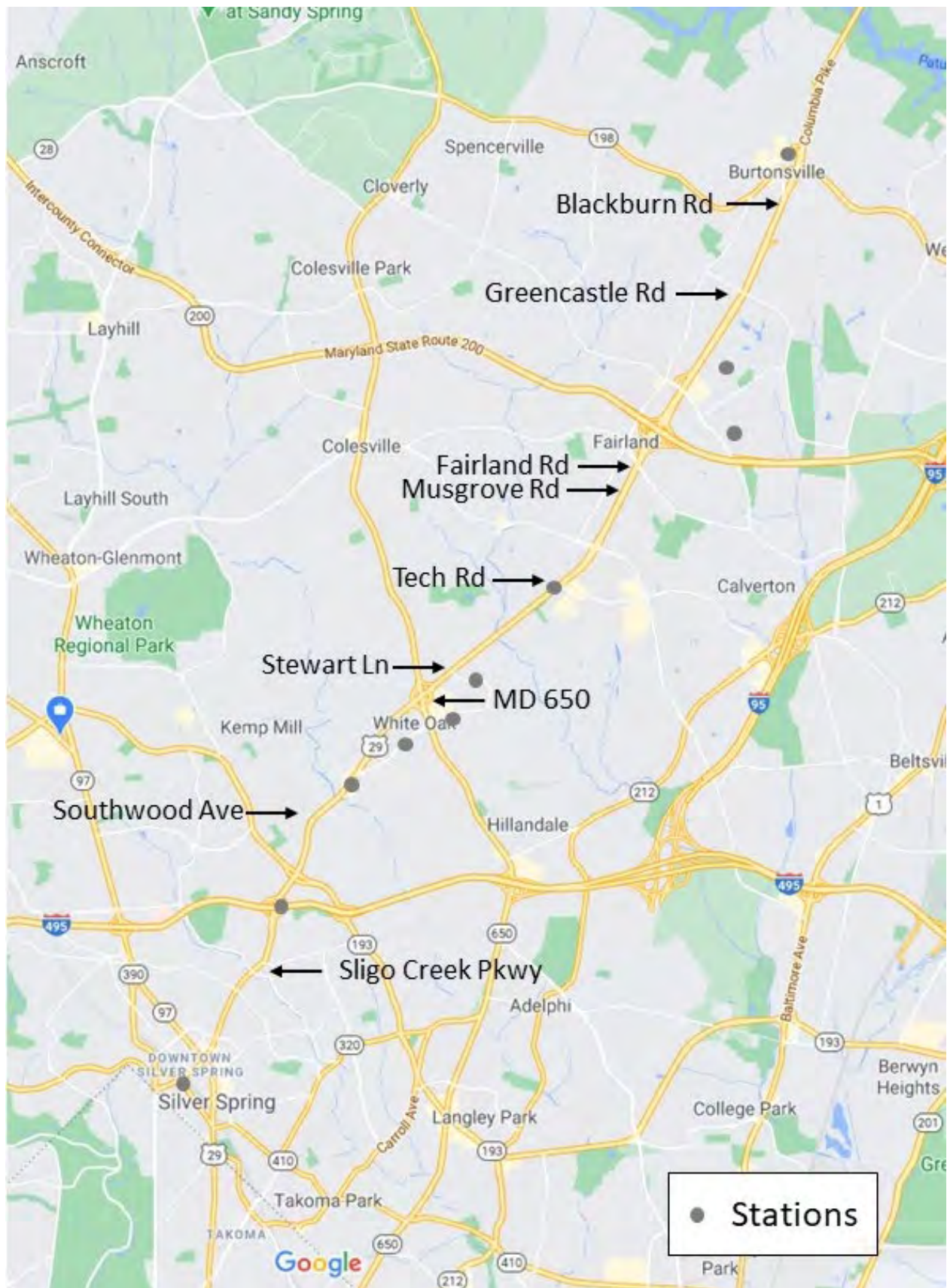
MCDOT's Recommendations

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

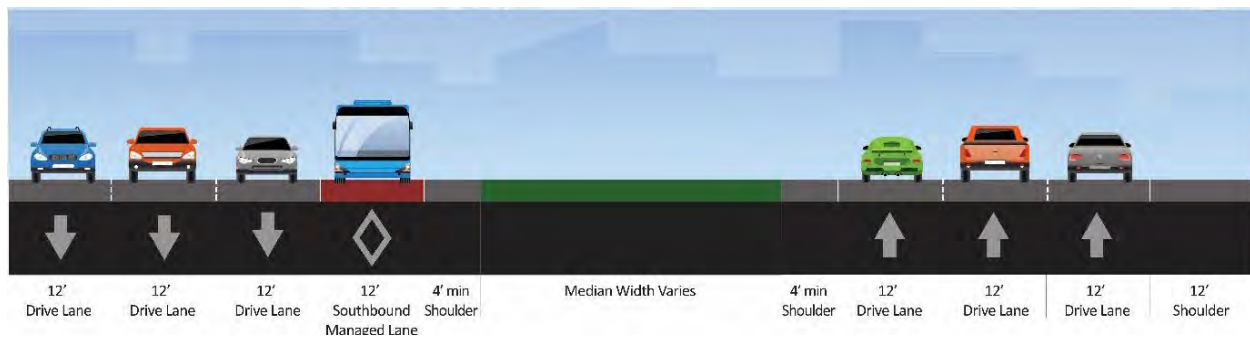
The study evaluates two transit options: the Median Bus Lane and Managed Lanes alternatives:

- **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.

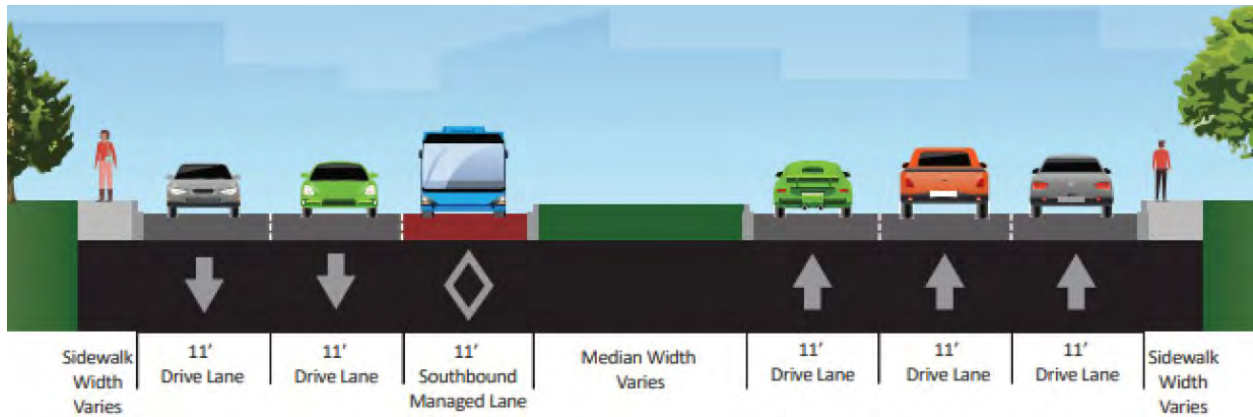
- Managed Lanes Alternative:** In contrast to the Median Bus Lane alternative, the Managed Lanes alternative increases both transit and motor vehicle capacity. The Managed Lanes alternative is a combination of full-time bus/carpool lanes, peak period managed bus/carpool lanes, and hard shoulder running 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.**



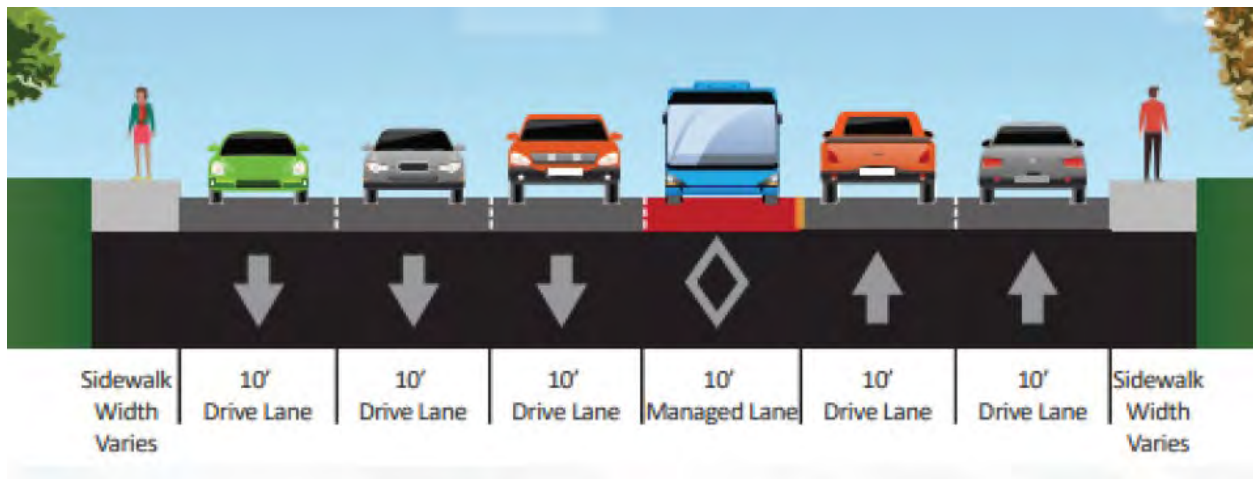
- From Musgrove Road to Stewart Lane, the inner lane becomes a bus/carpool lane in the southbound direction in the AM peak, with the outside shoulder being converted to a general purpose lane. In the PM peak, the northbound inner lane becomes a bus/carpool lane and the outside shoulder is converted to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

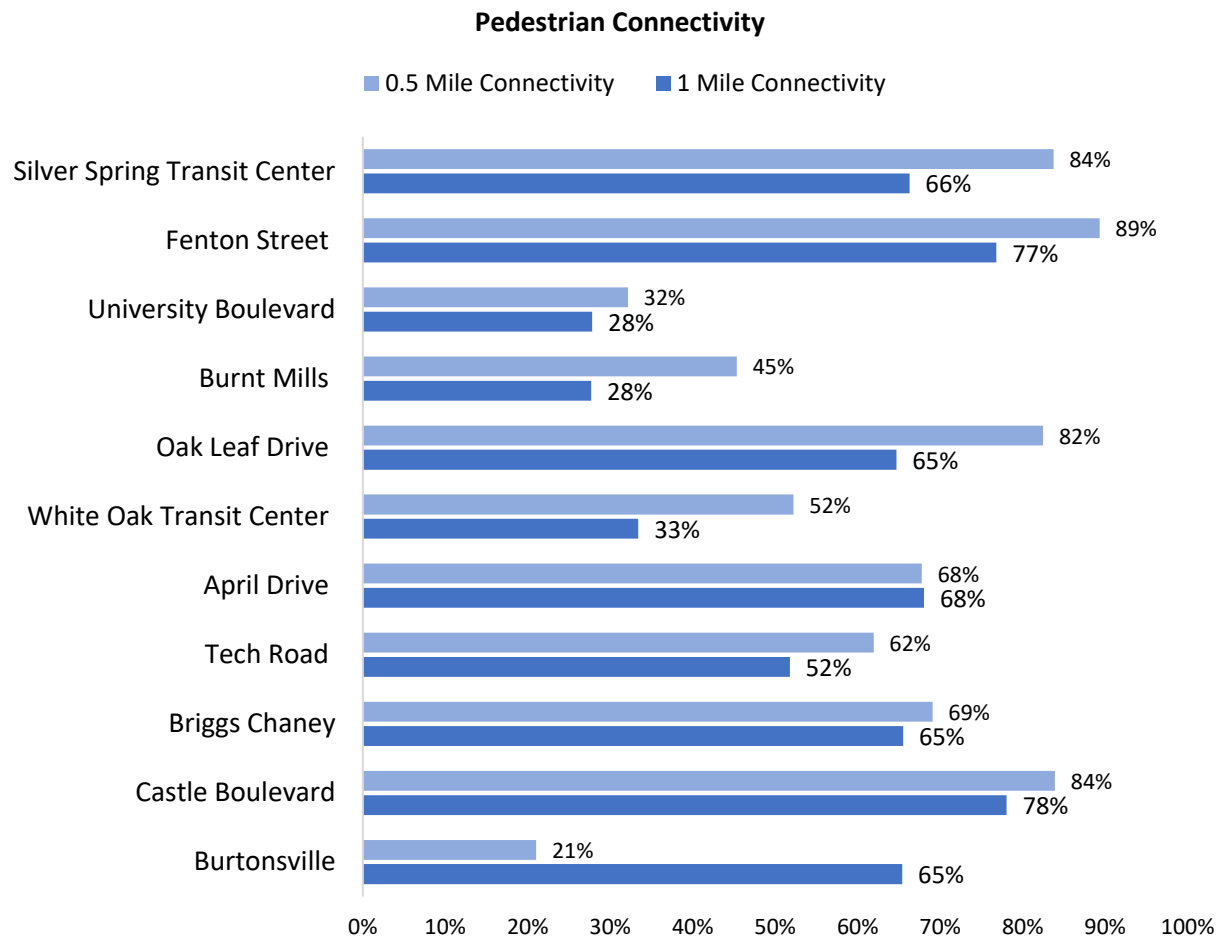
Description

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

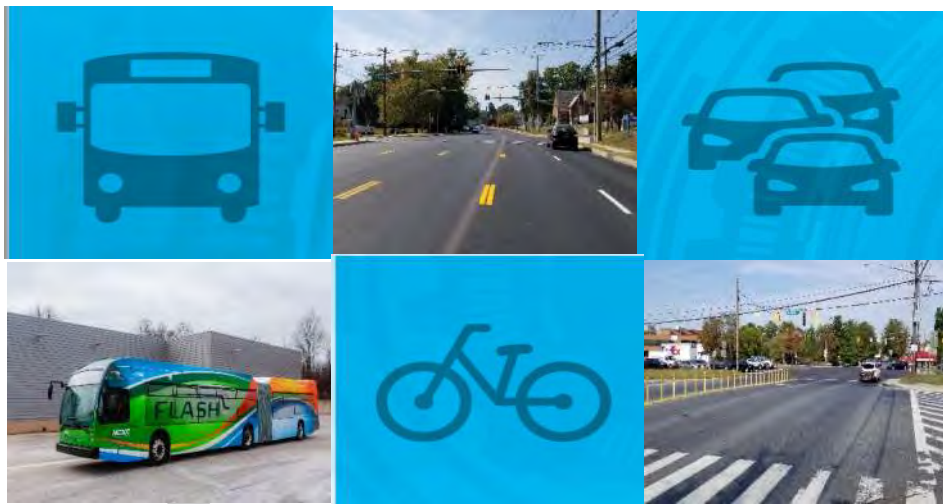
- A. US 29 Mobility & Reliability Study
- B. Staff Report for 65% Design for the US 29 Bus Rapid Transit Project (MR2018038, July 2018)
- C. Staff Report for Draft US 29 Bus Rapid Transit Corridor Study (February 2017)

- D. Scope of Work for US 29 Mobility & Reliability Study
- E. US 29 Master-Planned Right-of-Way
- F. US 29 Mobility & Reliability Study – Appendix III
- G. Detailed Staff Comments

Attachment A: US 29 Mobility & Reliability Study

Draft

US 29 Mobility & Reliability Study
Technical Report
July 2020



MC DOT
Montgomery County
Department of Transportation

**Mead
& Hunt**

This page intentionally left blank.

Draft

Table of Contents

Table of Contents	i
List of Tables	iii
List of Figures	iii
Appendices	iv
Introduction.....	1
Existing Conditions.....	2
Study Area and Study Corridor	2
Land Use	2
Population, Jobs, and Income.....	3
Corridor Travel Patterns.....	4
Previous Studies	8
US 29 Bus Rapid Transit (BRT) County and State Studies.....	10
US 29 Related BRT Studies.....	12
US 29 Related Traffic and Transit Studies.....	12
Countywide and Regional Transit Studies	13
Related Regional Studies.....	15
Functional and Master Planning Documents	15
Existing Roadway Conditions and Traffic Operations.....	19
Transit Conditions	28
Existing FLASH Station Accessibility	34
Station 1 – Silver Spring Transit Center.....	34
Station 2 – Fenton Street	36
Station 3 – University Boulevard.....	38
Station 4 – Burnt Mills	40
Station 5 – Oak Leaf Drive	42
Station 6 – White Oak Transit Center	44
Station 7 – Stewart Lane.....	46
Station 8 – Tech Road	48
Future Traffic Forecasts and Traffic Operations	50
Population, Households, and Employment	50
Travel Forecasting Methodology.....	52
2025 No Action Analysis	55
Alternatives Development and Evaluation	61

2025 Median Bus Lane Corridor Alternative Evaluation 69

2025 Managed Lane Analysis..... 79

Comparison of Alternatives 88

Summary of Findings and Recommended Mobility Package 91

Draft

List of Tables

Table 1	2017 Daily Vehicle Trips To and From the US 29 Subarea.....	6
Table 2	2017 Average Weekday Vehicle Trips using US 29.....	6
Table 3	Summary of US 29 Studies and Plans.....	7
Table 4	Signalized Intersection Level of Service Delay Ranges.....	22
Table 5	Unsignalized Intersection Level of Service Delay Ranges.....	22
Table 6	Existing Failing Intersections.....	23
Table 7	Existing Failing Segments.....	24
Table 8	VISSIM Modeled Travel Times.....	25
Table 9	VISSIM Modeled Person Throughput.....	26
Table 10	Existing Transit Operations along US 29.....	30
Table 11	RideOn Ridership/.....	31
Table 12	WMATA Ridership.....	33
Table 13	US 29 Corridor Land Use 2017-2040 by District.....	50
Table 14	2025 No Action Failing Intersections.....	56
Table 15	2025 No Action Failing Segments.....	57
Table 16	2025 Median Bus Lane Failing Intersections.....	75
Table 17	2025 Median Bus Lane Failing Segments.....	76
Table 18	2025 Managed Lane Failing Intersections.....	83
Table 19	2025 Managed Lane Failing Intersections.....	84

List of Figures

Figure 1:	BRT study area and Study Corridor.....	2
Figure 2:	US 29 Corridor Existing Land Use.....	3
Figure 3	US 29 Travel Market Subareas.....	5
Figure 4	2017 Average Weekday Vehicle Trip O-Ds Using US29.....	7
Figure 5	2018 US 29 Traffic Volumes by Mode.....	19
Figure 6	Existing Travel Times by Mode from Tech Road to Georgia Avenue.....	20
Figure 7	Person throughput illustration.....	21
Figure 8	Existing Conditions Level of Service.....	27
Figure 9	Existing US 29 Corridor Transit Services.....	29
Figure 10	US 29 Corridor Land Use 2017 -2040 By District.....	51
Figure 11	US 29 Subarea Change in Employment and Households, 2017-40.....	52
Figure 12	Subarea Assignment Process (MWCOC Base Model).....	54
Figure 13	2025 No Action Link and Intersection Level of Service – Vehicles.....	58
Figure 14	2025 No Action Link and Intersection Level of Service – BRT.....	59
Figure 15	2025 No-Action Modeled Travel Times Between MD 198 and Georgia Avenue.....	60
Figure 16	Intersection Improvement Screening Matrix.....	62
Figure 17	Previous study interchange design concept for US 29/ Greencastle Road.....	63
Figure 18	Intersection / Interchange Improvement Concepts and Costs.....	64
Figure 19	Transportation Systems Management and Operations Strategies.....	67
Figure 20	Median Bus Lane Concept.....	72
Figure 21	Median Bus Lane Typical Sections.....	73
Figure 22	2025 Median Bus Lane Link and Intersection Level of Service – Vehicles.....	77
Figure 23	2025 Median Bus Lane Link and Intersection Level of Service – BRT.....	78

Figure 24 2025 Median Bus Lane Travel Times Between MD 198 and Georgia Avenue.....79

Figure 25 Managed Bus Lane Typical Sections.....81

Figure 26 2025 Managed Lane Link and Intersection Level of Service – Vehicles.....85

Figure 27 2025 Managed Lane Link and Intersection Level of Service – Vehicles.....86

Figure 28 2025 Managed Lane Travel Times Between MD 198 and Georgia Avenue.....87

Figure 29 Person Throughput Comparison.....88

Figure 30 Travel Time Comparison.....89

Figure 31 Intersection Level of Service Comparison.....90

Figure 32 Mobility Package Recommendations by Segment.....93

Appendices

- Apendix I: Traffic Volumes
- Apendix II: Traffic Capacity Analysis Worksheets
- Appendix III: Pedestrian and Bicycle Improvement Graphics
- Appendix IV: Intersection Improvements and Corridor Bus Priority Plans
- Appendix V: Cost Estimate Worksheets
- Appendix VI: Design Impacts Matrix

Introduction

The Montgomery County Department of Transportation has completed a study to identify improvements on US 29 to complement the investment in FLASH service and 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. The focus of this study is to:

- examine conceptual intersection and traffic operational improvements that will benefit both transit travel and general traffic and have independent merit beyond the FLASH Project;
- identify new multi-modal bicycle and pedestrian infrastructure improvements; and
- explore an alternative transit priority guideway design concept.

Specifically, this study evaluates the median/ reversible bus lane concept developed by two US 29 Corridor Advisory Committee members, along with other alternative bus priority alternatives and targeted intersection and segment improvements.

This report is organized to present existing conditions, identify alternative improvement concepts and to present future No Action and Build conditions. The study scope includes: 1) documenting previous studies and recommendations; 2) reviewing existing traffic/ transit/ station area walking and biking conditions; 3) forecasting future traffic projections; 4) developing and evaluating a menu of improvement options; and 5) recommending a mobility improvement package for the corridor.

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, Maryland-National Capital Park and Planning Commission and County Council/ Executive.

Existing Conditions

Study Area and Study Corridor

The study network includes US 29 from the Silver Spring Transit Center to the Burtonsville Park and Ride (approximately 10 miles) and the spurs on Lockwood Drive/Stewart Lane (approximately two miles) and Briggs Chaney Road/Castle Boulevard (two miles), located within or adjacent to the existing US 29 right-of-way for up to 200-feet on either side of the existing edge of pavement.

FLASH Stations included in the current study corridor (see inset map) include:

Silver Spring Transit Center
Fenton Street
Four Corners
Burnt Mills

Oak Leaf Drive
White Oak Transit Center
April Lane
Tech Road

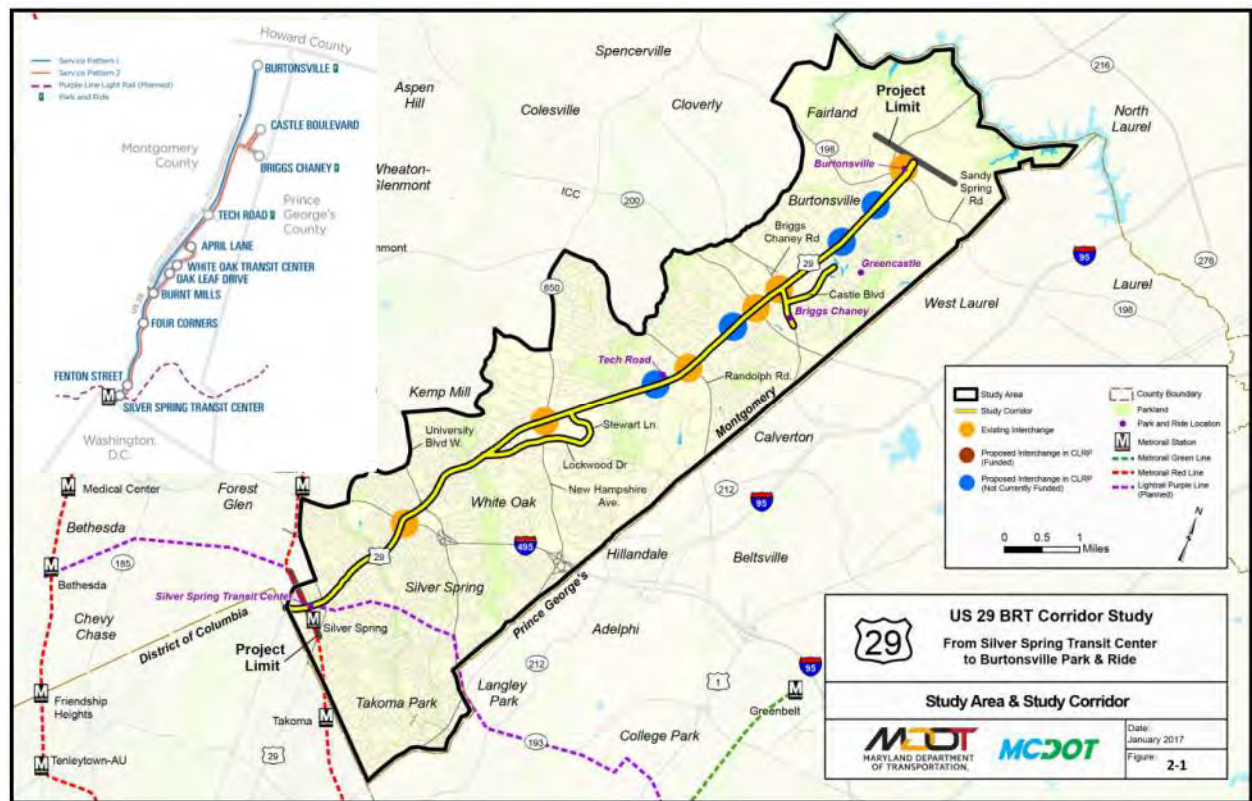


Figure 1: BRT study area and Study Corridor (Source: US 29 BRT Corridor Planning Study Report, MCDOT, 2017)

Land Use

US 29 within the BRT corridor serves as the spine that links the residential communities from Silver Spring to Burtonsville, with the regional activity and growth generators at Silver Spring and White Oak. At a regional level, US 29 is classified as a principal arterial in the southern segment and an expressway in the northern segment. It connects Washington, DC to Columbia and Ellicott City in Howard County.

Residential communities are located throughout the study area. There is a mixture of low, medium, and high-density residential areas, with concentrations of high-density residential development near Briggs Chaney Road, New Hampshire Avenue (MD 650), and in downtown Silver Spring. Commercial and institutional land uses are also dispersed throughout the corridor in Four Corners, White Oak, Fairland, and Burtonsville. Some industrial uses are located near Industrial Parkway and Tech Road.

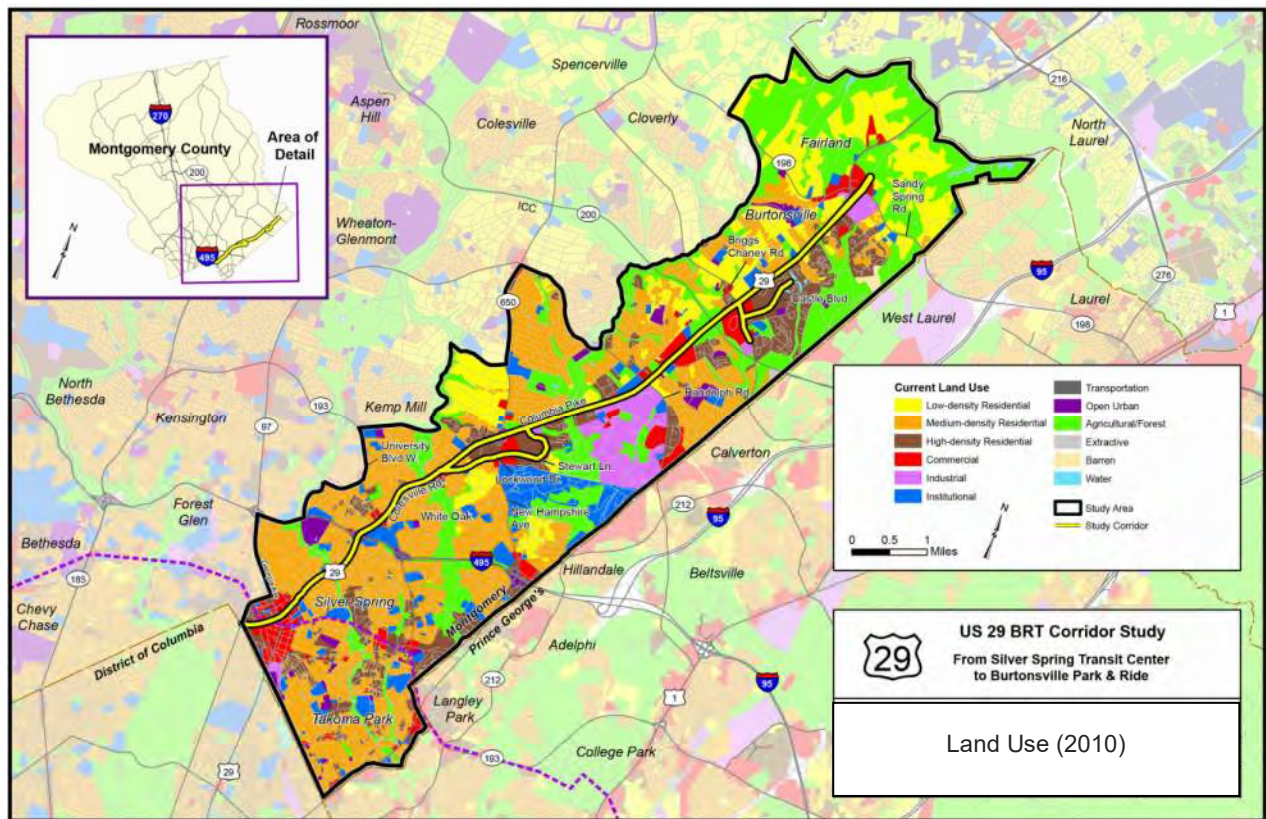


Figure 2: US 29 Corridor Existing Land Use (Source: Maryland Department of Planning and MDOT SHA)

Population, Jobs, and Income

In 2017 the Round 9.1 Cooperative Forecasts used in the COG travel model estimated the population in the study area to be 136,948. According to 2010 decennial US Census data, nearly 62 percent of study area residents are minorities and five percent of the households in the study area are considered low-income and living below the poverty line.

The Round 9.1 Cooperative Forecasts estimates for the 2017 number of households at 53,115 and employment at 61,880 jobs in the study corridor. The activity centers at White Oak and Silver Spring are expected to drive future growth in the study area.

Based on the 2017 American Community Surveys, Maryland has the highest median household income in the country. The most recent 12 month estimate is \$78,916. Montgomery County is the second wealthiest county within the state, with a median household income of \$103,178. The percentage of the population living below the poverty line for the State and the County are ten percent and seven percent respectively.

The average median household income in the corridor is \$95,292, which is about three percent lower than the County's median income. The percentage of the population living below the poverty line in the study area is five percent, which is two percent less than the County's overall population living below poverty. The areas with the highest median household income are concentrated in the northwest portion of the study area and Four Corners in the vicinity of US 29 and University Boulevard (MD 193). The areas with the lowest median household incomes are in the northeast section of the study area, as well as the southern portion of the study area near downtown Silver Spring.

Corridor Travel Patterns

In Travel Analysis, population, households, and employment are estimated for Traffic Analysis Zones as the basic building blocks of estimating travel throughout the region and in the study area. TAZs are geographic areas commonly used in conventional transportation planning models. The size of each zone may vary, depending on the policies and procedures of the metropolitan planning organization, but are typically generated to define an area occupied by approximately 3,000 people. These TAZs include US Census based data on socio-economic characteristics, employment, number of households and household income, and number of vehicles to compute existing and forecasted trips.

The TAZs developed for the study corridor are based upon a combination of the Metropolitan Washington Council of Governments/Transportation Planning Board (MWCOT/TPB) Regional Travel Demand Model, The Maryland-National Capital Park and Planning Commission (M-NCPPC) Travel/4 model, The White Oak Master Plan sub area, and additional refinements designed to better capture the travel in the study area. The Round 9.1 Cooperative Forecasts were used for Montgomery County along with additional refinements from the MNCPPC Planning department and inputs from updates to the White Oak Master Plan and White Oak developers.

US 29 serves vehicles travelling to, from, and through the subarea. As shown in **Figure 3**, market areas were defined for the Washington region in order to capture these travel patterns.

The 2017 average weekday vehicle trips to and from the US 29 study area are shown in **Table 1**. Some highlights from this table are:

- Approximately 312,000 vehicle trips move to and from the subarea on an average weekday
- 113,998 internal trips within the US 29 study area represent 37 percent of the total trips to and from the subarea
- While trips to and from Washington DC-are notable at 7%, trips to/from other nearby market areas also are significant with the largest market being to/from Southern Maryland (Prince George's, Anne Arundel, and other counties to the south) at 17%, Montgomery County inside I-495 at 9%, I-270 East at 10% and MD 97 East at 8%
- Trips to/from Columbia and other markets to the north were not as significant

It is worth noting that the Census Bureau also shows that DC-bound commuting trips were a major out-flow of trips from the study area, with 19,500 residents in the study area commuting to DC for work, based on the 2006-2010 Census Transportation Planning Products.

Because US 29 is also a major travel corridor serving the region's travel needs, trips to and from the subarea only tell part of the story. To better understand the travel through the corridor and the origins and destinations of through trips using US 29 as well as trips with an origin or destination within the study corridor, a select link analysis was also performed. These flows are shown statistically in **Table 2** and illustratively using bandwidths in **Figure 4**. Highlights include:

- While the maximum weekday volume at any one point along US 29 is from 60,000 to 70,000, the total daily trips using the corridor is 165,000
- Trips using US 29 originating from anywhere in the region and destined to US 29 are the largest volume at 58,400 vehicles
- Trips using US 29 and destined for external areas beyond the region are the next largest volume at 22,000
- Trips using US 29 and destined to the District are the third largest volume at 19,300
- Trips using US 29 and destined to Columbia are the fourth largest volume at 15,700
- Trips using US 29 and destined to Southern Maryland (Prince George's, Charles and St. Mary's County) are the fifth largest volume at 14,200
- Trips using US 29 and destined to Virginia or West Virginia are also notable at 11,100, as are trips using US 29 and destined within the County inside I-495 at 7,900

Note that these through trips have the potential to be diverted to other parallel facilities including I-95, I-295 and US 1.

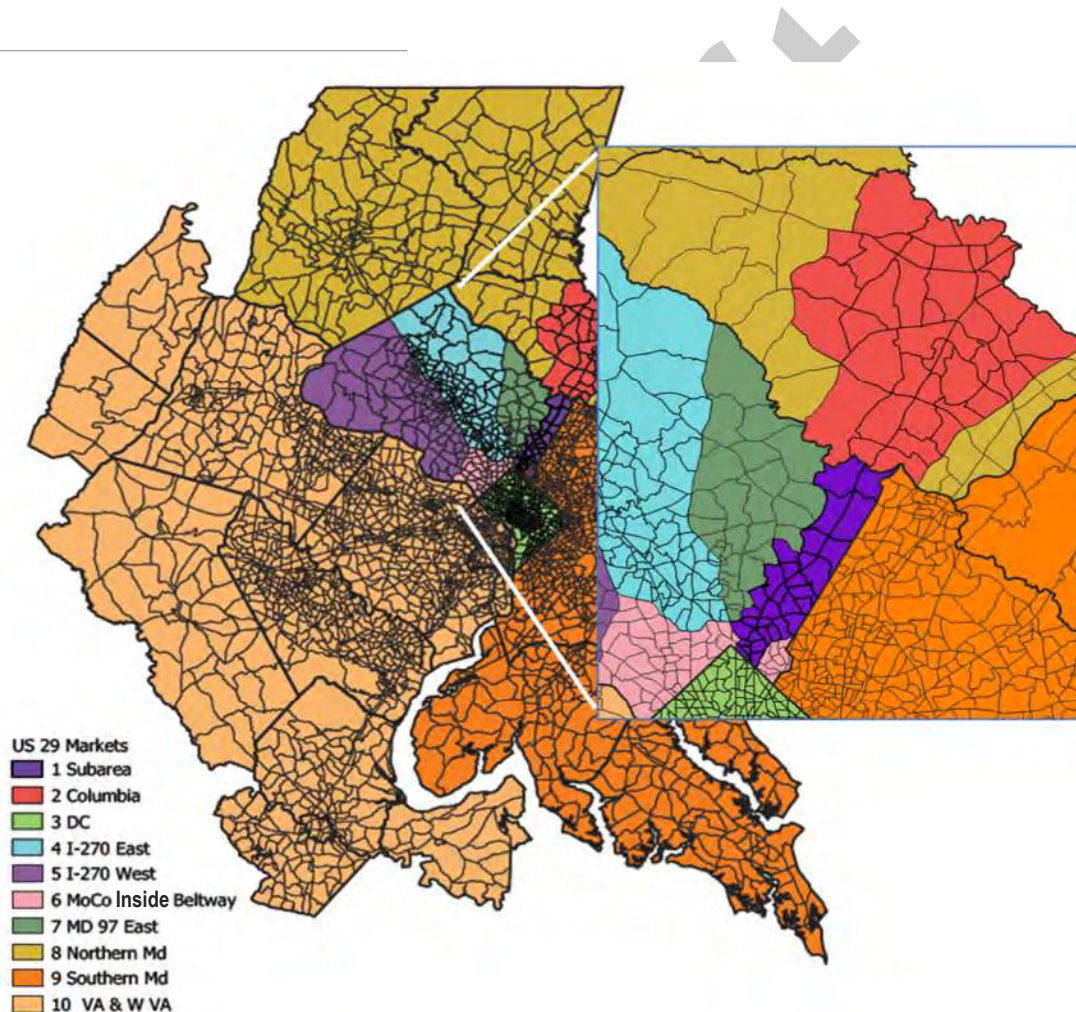


Figure 3 US 29 Travel Market Subareas

US 29 Mobility & Reliability Study Technical Report

Table 1 2017 Daily Vehicle Trips To and From the US 29 Subarea

	To Subarea		From Subarea	
	Trips	% Trips	Trips	% Trips
Market Area				
1 US 29 Subarea	113998	36.60%	113998	36.59%
2 Columbia	7540	2.42%	7472	2.40%
3 DC	22454	7.21%	22568	7.24%
4 I-270 East	29987	9.63%	29936	9.61%
5 I-270 West	8199	2.63%	8228	2.64%
6 MoCo Inside I-495	27582	8.86%	27694	8.89%
7 MD 97 East	25261	8.11%	25212	8.09%
8 Northern MD	5059	1.62%	5074	1.63%
9 Southern MD	53980	17.33%	54017	17.34%
10 Va & W. Va	7518	2.41%	7461	2.39%
11 External Sta.	9887	3.17%	9898	3.18%
TOTAL	311465	100.00%	311558	100.00%

Table 2 2017 Average Weekday Vehicle Trips using US 29

		US 29 Subarea	Columbia	DC	I-270 East	I-270 West	MoCo Inside I-495	MD 97 East	Northern MD	Southern MD	Va & W. Va	External Sta.	
Origin Name	Orig	1	2	3	4	5	6	7	8	9	10	11	Tot
1 US 29 Subarea	1	24492	3765	5366	1451	591	4465	2782	1157	7910	1572	4425	57976
2 Columbia	2	3811	0	4448	1808	512	1313	1125	0	1203	1605	35	15860
3 DC	3	5417	4408	0	2	0	0	1596	524	1510	0	7725	21182
4 I-270 East	4	1771	1847	4	0	0	22	0	180	944	0	1442	6210
5 I-270 West	5	727	544	1	0	0	0	0	44	371	0	189	1876
6 MoCo Inside I-495	6	4641	1395	0	9	1	0	259	89	386	0	1520	8300
7 MD 97 East	7	3046	1122	2029	0	1	361	11	132	794	259	839	8594
8 Northern MD	8	1190	0	697	123	29	67	105	0	102	32	0	2345
9 Southern MD	9	7089	1018	371	292	66	170	429	70	3	18	816	10342
10 Va & W. Va	10	1774	1619	0	0	0	0	179	23	40	0	4708	8343
11 External Sta.	11	4430	25	6442	1284	179	1507	676	0	997	7574	424	23538
	Tot	58388	15743	19358	4969	1379	7905	7162	2219	14260	11060	22123	164566

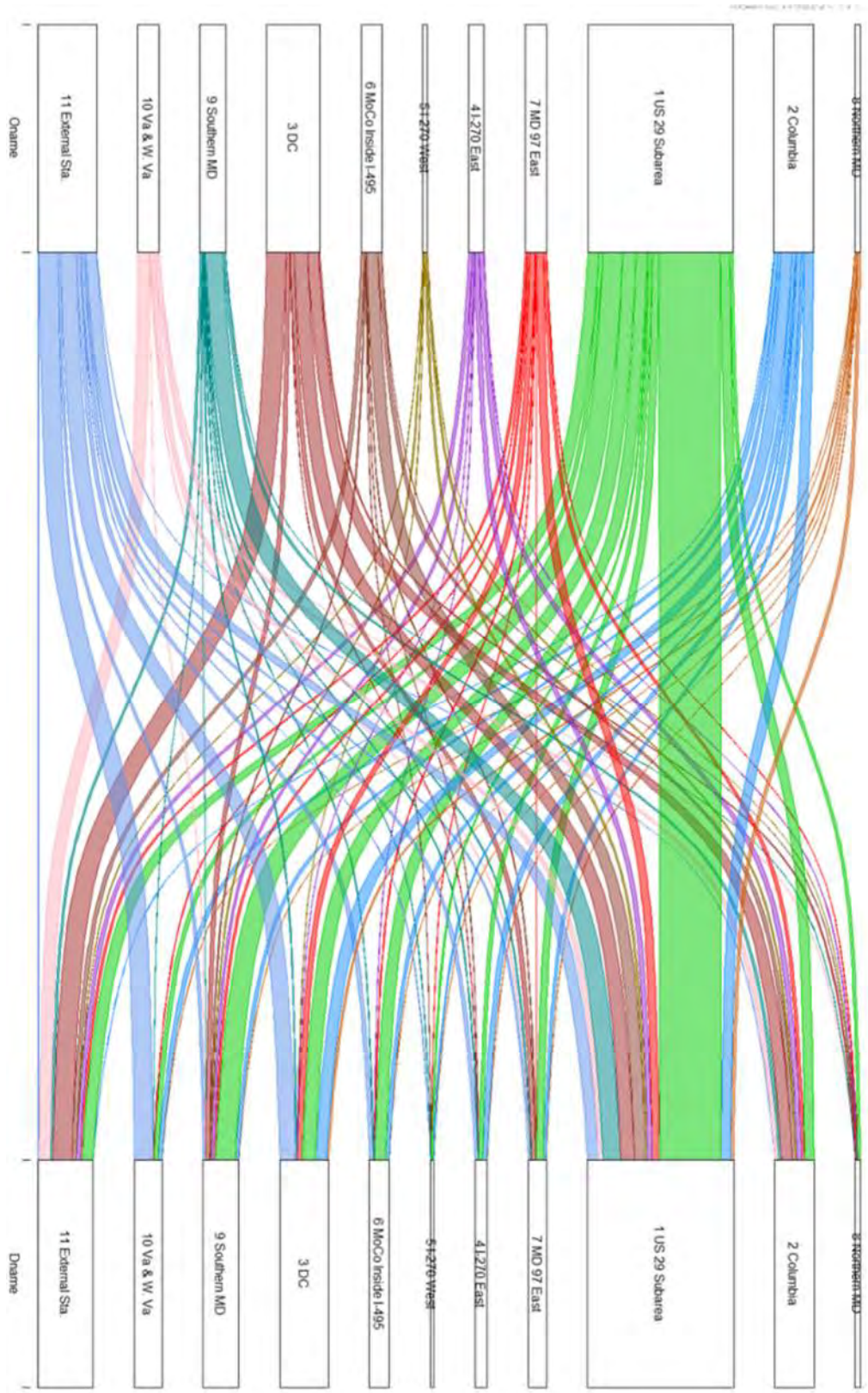


Figure 4 2017 Average Weekday Vehicle Trip Origins and Destinations Using the US29 Corridor

Previous Studies

This section summarizes previous transportation studies conducted within the corridor, corridor and regional traffic and transit studies, and current functional and master plans. Studies and plans reviewed in this section are listed in Table 3.

Table 3. Summary of US 29 Studies and Plans

US 29 Bus Rapid Transit (BRT) County and State Studies		
US 29 Busway Feasibility Study	MCDOT	1996
US 29 Bus Operations Analysis	MDOT SHA	2001
Existing Conditions: Signal Systems and Operations on Corridors Rapid Transit System Transit Signal Priority Technical Memorandum 2 & Rapid Transit System Transit Signal Priority Findings and Recommendations Technical Memorandum 3	MCDOT	2013
US 29 Transit Reliability and Travel Time	MCDOT	2015
US 29 Bus Rapid Transit Corridor Planning Study Preliminary Purpose and Need Document	MDOT SHA	2015
US 29 Managed Lane Feasibility Analysis	MCDOT	2016
TIGER Grant Application	MCDOT	2016
US 29 Bus Rapid Transit Corridor Planning Study - Corridor Study Report	MCDOT, MDOT MTA, MDOT SHA	2017
US 29 Bus Rapid Transit Corridor Planning Study/Preliminary Conceptual Alternatives & Traffic Operations Analysis Results	MCDOT, MDOT MTA, MDOT SHA	2017
US 29 Bus Rapid Transit Montgomery County Council T&E Committee Work session	MCDOT	2017
US 29 BRT Dedicated Lanes Concept	Emerson/Smoot, Better BRT	2016, 2018
US 29 Before/After Study from MD 198 to MD 193	MDOT SHA	2006
Pedestrian Roadway Safety Audit University Boulevard (MD 193) and Colesville Road (US 29)	MCDOT	2011
US 29/Cherry Hill Transit Oriented Development Scenario Planning Report	M-NCPPC	2011
US 29 Fairland/Musgrove Interchange Study	MDOT SHA	2014

US 29 Mobility & Reliability Study Technical Report

US 29 Bus Rapid Transit Regional Traffic Impact	UMD	2016
US 29 Existing Conditions Report	MCDOT	2017
US 29 Reversible Lane Removal Study	MDOT SHA District 3	2018
Countywide and Regional Transit Studies		
Countywide Bus Rapid Transit Study Consultant's Report	MCDOT	2011
Demand and Service Planning Report for the Proposed Montgomery County Maryland BRT System	MCDOT	2012
Montgomery County Rapid Transit System Service Planning and Integration Report	MCDOT	2014
County Executive's Transit Task Force Final Report and Recommendations	Montgomery County	2015
Z Line Study	WMATA	2015
Howard County Bus Rapid Transit Phase II Study Technical Report	Howard County	2016
Related Regional Studies		
MD 193 Road Diet Study	MDOT SHA	2016
Maryland State Highway Mobility Report	MDOT SHA	2016
Mobility Assessment Report	M-NCPPC	2017
Functional and Master Plans		
Montgomery County Master & Sector Plans (Fairland, Four Corners, North & West Silver Spring, Silver Spring Streetscape and White Oak)	M-NCPPC	Varies
Purple Line Functional Plan	M-NCPPC	2010
Burtonsville Crossroads Neighborhood Plan	M-NCPPC	2012
Countywide Transit Corridors Functional Plan	M-NCPPC	2013
White Oak Science Gateway Master Plan and Local Area Transportation Review (LATR) Intersection Improvement Cost Evaluation Study	M-NCPPC	2014
Silver Spring CBD Bicycle and Pedestrian Priority Area	M-NCPPC	2015
Federal Research Center Master Plan Draft Environmental Impact Statement	GSA-USFDA	2018

US 29 Bus Rapid Transit (BRT) County and State Studies

US 29 Busway Feasibility Study – MCDOT, January 1996

The study proposes a 3.4-mile busway along US 29 from Sligo Creek Parkway to north of Stewart Lane. Recommended roadway improvements include the elimination of 30 left turns along the corridor, mountable curbs for busway and emergency vehicle use, dedicated reversible lane in center of the road with medians on either side. Expansion and closure of the median at Lorain Ave, Timberwood Avenue, and Lanark Way is also recommended, as is a contraflow dedicated lane in the Four Corners section. Signal phasing improvements are also recommended throughout the corridor, as well as two new signals at Hastings Drive and Crestmoor Drive.

Recommendations for non-motorized improvements include crosswalks, pedestrian-actuated signal heads, and median refuge areas at strategic locations throughout the corridor, and sidewalks for pedestrians and bicycles on both sides of US 29 for the length of the busway.

US 29 Bus Operations Analysis – MDOT SHA, October 2001

The study addresses vehicular and bus travel times and delays along US 29 between the Burtonsville Crossing Shopping Center and Silver Spring Metro Station, and predicts operations under year 2007 traffic conditions, when grade separations at the intersections of US 29 and MD 198, Briggs Chaney Road and Randolph Road were to be built and operational. The study concludes that 2007 bus operations are not expected to deteriorate, and rather expected to improve over the 2001 signalized intersection conditions in light of proposed grade separations.

Existing Conditions: Signal Systems and Operations on Corridors Rapid Transit System Transit Signal Priority Technical Memorandum 2 & RTS Transit Signal Priority Findings and Recommendations Technical Memorandum 3 – MCDOT, 2013 and 2014

The primary goal of the study is to define the appropriate metrics for the implementation of TSP systems on each RTS corridor, building on what was developed for TSP for local bus operations. Technical Memorandum 2 describes the existing conditions of signal systems and traffic/transit operations on the proposed RTS corridors within Montgomery County. Recommendations for the US 29 corridor include a mix of two-lane median busways, mixed traffic operations, dedicated curb lanes in the peak hour direction and curb lanes via lane-repurposing.

Technical Memorandum 3 summarizes the current status of TSP and RTS within Montgomery County, develops a preliminary concept of operations for key RTS operational scenarios, and estimates costs for TSP components. Recommendations include testing for advanced TSP strategies and technologies (phase rotation, phase omission, phase insertion, predictive priority, adaptive signals, etc.), developing policies for synergistic priority strategies and developing a services hierarchy.

US 29 Transit Reliability and Travel Time – MCDOT, March 2015

The memorandum documents the US 29 corridor travel time and on time performance (OTP) analysis carried out using Automatic Vehicle Location (AVL)/Automatic Passenger Counter (APC) data provided by WMATA and Ride On for a period from October 3 to October 7, 2016. It was determined that BRT would provide an end to end travel time savings of around 26% from Burtonsville to Silver Spring, but this savings varies between specific Origin/Destination pairs depending on the directness of the current service, location, and other factors. A savings as high as 60% could occur between Burtonsville and White Oak,

and a savings of only 0% to 2% from Four Corners to the Silver Spring Transit Center. BRT may also improve reliability over current bus service.

US 29 Bus Rapid Transit Corridor Planning Study Preliminary Purpose and Need Document – MDOT SHA, December 2015

This document identifies existing and future transportation needs in the US 29 corridor study that BRT would address and provides an initial foundation for a NEPA Purpose and Need statement in the event the project moves into a future development phase. Based on the problems and issues identified, four specific needs for the US 29 corridor and study area are discussed: transit demand and attractiveness, mobility, system connectivity, and livability. The preliminary purpose statement includes five goals to guide development of BRT alternatives: to improve the quality of transit service, to improve mobility opportunities and choices, to develop transit services that enhance quality of life, and to develop transit services that support master planned development.

US 29 Managed Lane Feasibility Analysis – MCDOT, January 2016

The analysis assesses the feasibility of converting vehicle travel lanes along US 29 to a managed lane to serve the proposed BRT system, HOV-compliant vehicles, and right turns based on resulting traffic impacts. The study concludes that redistributing traffic volumes based on the managed lane scenario would result in uneven lane utilization which causes some lanes within each segment to perform at or above capacity even after considering potential shifts from SOV to HOV. Therefore, a managed lane is only recommended in the southern (Silver Spring to Sligo) and northern (MD 193 to MD 650) segments of the corridor.

TIGER Grant Application – MCDOT, April 2016

The TIGER Grant Application seeks to secure funds for a 14-mile BRT service along US 29 from Burtonsville Park and Ride to Silver Spring Transit Center. The BRT line would use the existing roadway pavement where possible, and would include managed lanes, Bus on Shoulder, and a small segment of mixed traffic.

US 29 Bus Rapid Transit Corridor Planning Study - Corridor Study Report – MCDOT, MDOT MTA, MDOT SHA, April 2017

The report documents the evaluation of alternatives to provide new BRT service along US 29. Alternatives evaluated include the No -Build and the three conceptual alternatives identified in the US 29 Bus Rapid Transit Corridor Planning Study - Preliminary Conceptual Alternatives & Traffic Operations Analysis Results. Among other items, it compares the alternatives in light of ridership, accessibility to jobs and activity centers, Level of Service during peak hours, and construction costs. It also documents potential impacts to properties, historic resources, natural resources, and minority and low-income populations. It is anticipated that these communities will benefit directly from the new transit service provided.

US 29 Bus Rapid Transit Corridor Planning Study/Preliminary Conceptual Alternatives & Traffic Operations Analysis Results – MCDOT, MDOT MTA, MDOT SHA, April 2017

The report documents traffic modeling assumptions and analysis results performed in support of the US 29 BRT Corridor Planning Study, which evaluates alternatives to provide new BRT services along US 29. The traffic operations analysis portion of this study includes the traffic modeling and analysis findings for the 2040 No-Build, Alternative A: Peak Direction Curbside BAT Lanes (South)/Dedicated Median Shoulder BRT Lanes (North); Alternative B: Curbside Managed Lanes (South)/Bus-on-Outside-Shoulder (North), and Alternative B Modified: Curbside Managed Lanes (South)/Dedicated Median Shoulder BRT Lanes (North).

The study concludes that Alternative B Modified provides the highest level of transit service (i.e., fastest and moves the most amount of people) but significantly degrades Single Occupancy Vehicle (SOV) service. Alternative B seems to be relatively mid-range for improvement to level of transit service without as much

of an impact on SOV service. Recommended refinements for future study include signal timing and TSP enhancements, alternative BRT alignments, modification to the lane repurposing segments, geometric improvements to increase capacity at constrained locations, enhanced Transportation Demand Management to reduce SOV demand, and improvements to traffic flow through the BRT transition areas.

US 29 Bus Rapid Transit Montgomery County Council T&E Committee Work session – MCDOT, May 2017

The Committee unanimously recommended the programming of funds for the TIGER project as a Fiscal Year 2018 appropriation of \$9.5 million and an amendment to the Fiscal Year 2017 -2022 CIP to the Rapid Transit System project for \$31.5 million to fund the first stage of implementation of a 14-mile-long US 29 Bus Rapid Transit (BRT) line between Burtonsville and the Silver Spring Metro Station. Summary of public outreach activities were also presented as well as funding for MetroExtra service.

US 29 Related Transit Advocate Concepts

US 29 BRT Dedicated Lanes Draft Concept – Emerson/Smoot, 2016 and Better BRT, 2018

As part of the Better BRT plan, this concept proposes upgrades to the current BRT plan along most of the US 29 corridor. Suggested improvements include reducing travel lane widths to provide for a median busway. The busway would be 2 lanes where right-of-way permitted and a single reversible lane where constrained south of Granville Drive and south of Sligo Creek Parkway.

US 29 Related Traffic and Transit Studies

US 29 Before/After Study From MD 198 to MD 193 – MDOT SHA, 2006

The study evaluates weekday peak period traffic operations and overall transportation system impacts in lieu of highway improvements on US 29 between Sandy Spring Road and University Boulevard. Year 2000 is the before condition and Year 2006 is the after condition. The study conducts a total build-out analysis of US 29 with proposed interchanges at Greencastle Road, Fairland/Musgrove Road, Tech Road, and Stewart Lane. It also develops year 2015 traffic forecasts for US 29 and conceptual lane arrangements from the preferred alternatives at Briggs Chaney Road intersection (completed 2008).

Pedestrian Roadway Safety Audit University Boulevard (MD 193) and Colesville Road (US 29) – MCDOT, July 2011

This document summarizes the results of a pedestrian road safety audit for the intersection of US 29 and MD 193 in Silver Spring, MD (Four Corners). The document identifies a variety of issues related to pedestrian and bicycle safety and develops general suggestions to improve pedestrian and bicycle safety in the study area including signage and signal improvements, deterrents to mid-block crossings, and coordination with transit services to improve bus stop waiting areas.

US 29/Cherry Hill Transit Oriented Development Scenario Planning Report – M-NCPPC , June 2011

The report examines the results of a Transit-Oriented Development (TOD) scenario planning exercise in a study area primarily located in the Cherry Hill Employment Area, east of US 29 south of Cherry Hill Road. The planning exercise includes three main components: 1) a literature review examining TOD best practices, particularly in relation to the large USFDA Federal Research Center campus; 2) a transit sketch-planning analysis; and 3) a land-use scenario testing analysis. The report concludes that the study area is a good candidate for increased bus service and potentially light rail transit (LRT) or BRT in the future with some higher-density development around station areas.

US 29 Fairland/Musgrove Interchange Study – MDOT SHA, 2014

MDOT SHA evaluated the geometric, environmental, cost and traffic operations of a new interchange. Recommendations include grade separation at the intersections of US 29 at Fairland Road and Musgrove Road and construction of a service road starting at Musgrove Road and merging with US 29 prior to Tech Road.

US 29 Bus Rapid Transit Regional Traffic Impact – UMD, 2016

The study team uses advanced traffic modeling applications with predictive routing capabilities to evaluate the potential impacts of traffic diversions post-BRT implementation due to potential increased traffic congestion along US 29. The study concludes that during the PM Peak period, implementation of BRT results in an average speed change from 36 to 35 miles per hour, average vehicle miles traveled from 7.2 to 7.4, and average travel time per trip change from 13.3 minutes to 13.5 minutes over 2015 No-Build conditions.

US 29 Existing Conditions Report – MCDOT, August 2017

The report reviews and summarizes recent studies and plans for Ride On and Metrobus service on, to and near the US 29 corridor. It examines the Ride On and Metrobus routes that intersect and operate on the US 29 corridor. The report will be used to inform design of a feeder bus network that will comprehensively and efficiently serve the communities surrounding the corridor.

The study also identifies service gaps and recommends all-day service for the White Oak Shopping Center along Stewart Lane and Lockwood Drive, Calverton and Downtown Silver Spring. It also recommends additional peak hour service for Downtown Silver Spring and Forest Glen.

US 29 Reversible Lane Removal Study – MDOT SHA District 3

This study reviews the traffic and safety effects of removing the reversible lane along US 29. Due to funding issues, it is currently on hold and has not been completed.

Countywide and Regional Transit Studies

Countywide Bus Rapid Transit Study Consultant's Report – MCDOT, July 2011

This study analyzes the feasibility of a BRT network in Montgomery County via an initial screening to identify eligible county roads and potential design options within the right-of-way, and to determine travel demand along identified corridors as well as capital and operating costs for the network. A 13.5-mile potential route is identified along US 29 from Burtonsville Park-and-Ride at its northern terminus and the future Silver Spring Transit Center at its southern terminus and includes 11 station locations along the route. The plan uses density thresholds as a method to identify where BRT may be appropriate and makes general land use recommendations key to the success of BRT, including Transit-Oriented Development.

Demand and Service Planning Report for the Proposed Montgomery County Maryland BRT System – MCDOT, 2012

Of the 160 miles of BRT infrastructure on surface roads previously identified, this study recommends a phased approach to realistically building and operating a full BRT network in Montgomery County. The study estimates present passenger demands on the bus system based on operational data to evaluate potential initial ridership of the first three selected BRT corridors.

Montgomery County Rapid Transit System Service Planning and Integration Report – MCDOT, May 2014

The report builds upon the body of knowledge that has been developed for a BRT network in Montgomery County and provides guidance for further Rapid Transit System (RTS) planning among the key BRT

corridors: Randolph Road, MD 355, Georgia Avenue, Veirs Mill Road, New Hampshire Avenue, and US 29. The study also examines integration of planned BRT and local bus service, as well as a summary of regional land use plans. The concept for US 29 focuses on connecting activity centers, multimodal transit nodes, as well as providing transportation opportunities from Burtonsville to Silver Spring. Local service modifications include use of the US 29 BRT infrastructure, where accessible, by Metrobus Z routes, MTA Commuter buses, and Ride On. Metrobus Route Z8 would continue with half the headways of service.

County Executive's Transit Task Force Final Report and Recommendations – Montgomery County, October 2015

The Transit Task Force reconvened in April 2015 to study legislation proposed in the 2015 Session of the Maryland General Assembly, develop procedures for soliciting community and business input, provide advice on the proposed legislation, and identify potential funding sources relating to the RTS network as part of an overall financial plan. The Task Force proposes an additional half cent sales tax to fund transit and supports legislation to empower the County to develop its transit authority. Recommendations in the report include: establishing special tax districts; introducing a new excise tax on commercial property rentals to finance the transit system; creating a dedicated fund for transit; requiring the transit authority to submit annual and long-term budgets and financial audits; requiring council approval for eminent domain and ensuring the transit authority adheres to county ethics; and allowing the transit authority to enter into multi-jurisdiction agreements.

Z Line Study – WMATA, January 2015

WMATA, with input from Montgomery County, completed a study for seven Metrobus routes that provide connections along the US 29 corridor: Z2 Colesville-Ashton Line, Z6 Calverton-Westfarm Line, Z8 Fairland Line, Z9/Z29 Laurel-Burtonsville Express Line and Z11/Z13 Greencastle-Briggs Chaney Express Line. Developed through public outreach and technical analysis, a summary of plan recommendations follows.

Z Line service improvements are proposed for short-term (1-2 years) implementation and include adding trips to Z8 weekday mid-day service, adding trips to Z8 Saturday service, adding an additional Z6 weekday evening trip, and adjusting schedules to reflect observed run times. Mid-term (3-4 years) recommendations include implementing Z6 Saturday service and modifying Z8 frequency and implementing new peak MetroExtra service. Long-term (5-6 years) recommendations include expanding some Z Line mid-day and Saturday service areas.

Operational improvements include implementing dedicated supervision to proactively manage bus departures and adding additional stops on Z Lines Express Services (Z9, Z11, Z13, and Z29). Proposed passenger facility improvements include ADA compliance and pedestrian safety improvements; the addition of amenities such as shelters, benches and trash receptacles; signal timing and phasing; stop locations; and addressing general congestion along US 29.

Howard County Bus Rapid Transit Phase II Study Technical Report – Howard County, April 2016

This report documents Howard County BRT Phase II Study efforts, analysis, and results. The study focuses on US 29, Broken Land Parkway and US 1. The study examines specific route alignment and stations, ancillary feeder transit services, landside services such as park and ride and pedestrian accessibility, preliminary operating costs, and land use plans to support high quality transit service within and between the study corridors.

Based upon the recommended BRT system for US 29 and related local/feeder bus service, the study documents a significant travel market and demand for high quality BRT to and from Howard County for each of the three corridors. Among other items, recommended next steps include coordination with Montgomery County on US 29 corridor planning and preliminary engineering.

Related Regional Studies

MD 193 Road Diet Study – MDOT SHA, March 2016

MDOT SHA performed a roadway study along the MD 193 (University Boulevard) corridor from US 29 (Columbia Pike) to MD 320 (Piney Branch Road) per request by area elected officials and residents. The purpose of the study was to determine if a reduction of the road capacity from 6 lanes to 4 lanes is feasible. The study concluded that if a road diet is implemented, peak hour volume increases 2.5% and 6.5% north and south of I-495, respectively.

Maryland State Highway Mobility Report – MDOT SHA, 2016

The report documents the annual measurements of congestion along Maryland state highways including travel time reliability. US 29 from MD 650 to I-495 was ranked as one of the top 10 congested arterial segments in the State.

Mobility Assessment Report – M-NCPPC, February 2017

The report summarizes the trends, data, and analysis used to track and measure transportation mobility conditions in Montgomery County to provide information to residents and public officials regarding the current state of the county's transportation system, as well as how the system is changing and evolving. Although there are no specific recommendations, the report documents recent ridership and travel trends.

Approximately 40 percent of residents from Silver Spring, Friendship Heights and Grosvenor commute via public transportation. Ride On routes on US 29 saw an increase of 10 percent or more ridership from 2013 to 2015. MetroBus routes Z9/Z29 saw a 6.1 percent increase in ridership, while Metro Bus routes Z11 and Z13 on US 29 saw a weekday average decrease in ridership of -26.4 percent.

Forty percent of roadway mileage inside the Beltway experiences moderate to heavy or higher levels of congestion compared to approximately 13 percent outside beltway. Columbia Pike experiences two peak periods between University Blvd and Sandy Spring Rd in the southbound AM peak south of Randolph/ Cherry Hill Road and in the northbound PM peak between New Hampshire Avenue and Randolph/ Cherry Hill Road. Columbia Pike from Sandy Spring Rd to Howard County border has a sharp peak in congestion during the evening commute from 4 to 5 PM northbound and generally on Thursdays and Fridays. Colesville Road from I-495 to DC border is 87 percent congested throughout the evening commute in the southbound direction. In the northbound direction, both morning and evening commutes reach similar congestion levels.

The county has invested in many capital construction projects, regulatory changes, planning methods and data that seek to encourage a diverse transportation system. These include Bicycle Pedestrian Priority Areas (BiPPA), and currently five locations are being evaluated for BiPPA in Montgomery County. The Planning Department is preparing the Bicycle Master Plan and several capital improvement projects supporting bicycle and pedestrian travel. In the top twenty intersections with the highest pedestrian use, Colesville Road at Georgia Avenue and Fenton Street are #5 and #14, respectively. In the top twenty intersections that bicycle activities were observed, Colesville Road at Georgia Avenue was #13 with 54 bicyclists. However, there is very little activity along US 29 outside of the Silver Spring CBD.

Functional and Master Planning Documents

Fairland Master Plan, 1997

The plan reinforces existing development patterns with adjustments from the 1993 General Plan. Specific to transportation, the plan recommends enhancing mobility by providing safe and efficient transportation systems with a wide range of alternatives.

The plan does not make specific transit recommendations, however it does recommend grade-separated interchanges for all east-west crossings of US 29, and recommends reserving the ROW for all future transit improvements. It endorses sidewalks and walkways to improve pedestrian access to public transit, commercial centers, schools, parks and places of employment. The plan also supports safe and convenient bikeway network that connects to local community centers, services and recreational facilities and expands commuting opportunities for biking.

Four Corners Master Plan, 1996

The plan balances transportation needs of regional through traffic and local traffic by recommending road improvements at main intersections and enhanced system for cyclists and pedestrians to create a more conducive multi-modal environment.

The plan encourages increased use of transit with bus service that connects Four Corners with Silver Spring and Forest Glen Metro Stations. It also recommends intersection improvements for Colesville Road and University Boulevard, including pedestrian and streetscape amenities. It promotes use of transit ridesharing and other traffic mitigation measures, including compressed workweeks and telecommuting among employees and residents in and near the US 29 corridor. It suggests pedestrian circulation and safety should be improved by constructing sidewalks that connect neighborhoods to the commercial district, schools, transit stops, parks and other community facilities. It states that the existing bikeway network should also be expanded to support local and regional systems and enhance value as an alternate means of transportation.

North and West Silver Spring Master Plan, 2000

The plan seeks to enhance stable residential neighborhoods, upgrade local commercial centers and generally improve connectivity. The plan's recommendations are designed to enhance and sustain area neighborhoods with upgraded infrastructure and a neighborhood friendly transportation system.

The plan generally calls for improved transit on US 29, and for the investigation of the feasibility of a transit center in White Oak Shopping Center. The plan suggests adding a separate right-turn lane on westbound Dale Drive at Colesville Road, which would require pavement widening, and it also calls for pedestrian circulation along Colesville Road including wide, tree-lined sidewalks on both sides of the street and safe pedestrian crossings.

Silver Spring Streetscape Plan, 1992

This plan describes an overall concept for the Silver Spring Central Business District streetscape system including street trees, lighting, paving, layout concepts and materials.

White Oak Master Plan, 1997

In addition to recommendations for residential communities and commercial centers, the plan recommends safe and attractive transportation improvements that enhance local circulation and convenience for all modes of travel within and through the communities of the White Oak Master Plan area. The plan proposes two transit centers, one in Colesville and another in White Oak. It proposes grade separated intersections along US 29. The plan also proposes a system of walkways and bikeways, and sidewalk improvements to enhance pedestrian and bicycle experience and improve community character.

Purple Line Functional Plan – M-NCPPC, September 2010

The plan identifies the Purple Line alignment and station locations throughout Montgomery County. No specific roadway or automobile improvements are recommended for US 29, however two stations on or near the US 29 corridor include the Fenton Street Station with platforms located adjacent to the Silver Spring Library, and the Silver Spring Transit Center Station, which is also a stop on the US 29 BRT. The

Silver Spring Transit Center Station also includes enhanced access from the Purple Line to Metrorail Red Line, local buses, MARC, inter-city bus and taxi service at Transit Center.

Burtonsville Crossroads Neighborhood Plan – M-NCPPC, December 2012

The plan is an amendment to the 1997 Fairland Master Plan and other regional plans which include the Burtonsville crossroads area. The Burtonsville Park and Ride is presented as an opportunity to link local businesses to the larger region, including access to US 29 and the planned Montgomery County BRT network (the Park and Ride is the planned northern terminus of the US 29 BRT route). The Park and Ride lot, located behind the Burtonsville Crossing Shopping Center, includes 500 spaces with access from US 29, Business 29 (Old Columbia Pike), and MD 198. It is served by MTA Commuter Bus, University of Maryland Shuttle, and ICC Bus to and from Baltimore-Washington International Airport, and Metrobus, including routes to Silver Spring, Amtrak and Metrorail stations. The plan calls for a shift from single-use to mixed-used zoning in the area around the Park and Ride, which would provide a mix of commercial and housing opportunities, support infill, and require privately owned public use space to be accessible to the public. It also recommends improving the grid pattern of local streets, adding streetscape to Business 29, and improving the bikeway along US 29.

Countywide Transit Corridors Functional Plan – M-NCPPC, December 2013

The plan recommends implementing a 102-mile Bus Rapid Transit (BRT) network and expanding right-of-way for CSX Metropolitan Branch to allow for enhanced MARC commuter rail service. The plan calls for dedicated bus lanes from Stewart Lane to Sligo Creek Parkway and from Georgia Avenue to Sixteenth Street, two additional dedicated lanes from MD 198 to Stewart Lane, and a dedicated lane in the peak-hour peak direction from Sligo Creek Parkway to Georgia Avenue. Station locations are identified at 11 locations throughout the corridor including the Burtonsville and Briggs Chaney park and rides, and White Oak and Silver Spring transit centers.

Roadway and traffic signal improvements are not specifically recommended in the plan. However, accommodation for pedestrians and bicyclists is recommended, particularly at transit-oriented development areas, established or developing activity centers, around Metro stations, and at transfer points between BRT routes.

White Oak Science Gateway Master Plan and Local Area Transportation Review (LATR) Intersection Improvement Cost Evaluation Study - M-NCPPC, 2014

The master plan is an amendment to several Master Plans in Montgomery County covering approximately 3,000 acres and makes recommendations for land use, density, zoning, transportation, environment, historic resources, parks and community facilities. The plan envisions White Oak's major centers – Hillandale, White Oak, and Life Sciences/FDA Village evolving from conventional, auto-dependent suburban shopping centers, business parks, and light industrial areas into vibrant, mixed-use, transit-served nodes.

The purpose of the LATR Study is to address potential LATR-scale costs for inclusion in a proposed per-trip fee that may be paid by new development in lieu of performing a complete LATR analysis and independently mitigating individual development's traffic impacts. The study concludes that for all study intersections on US 29, with the exception of Randolph Road/Cherry Hill Road, a proposed per-trip fee may be established by County Council and paid by new development in lieu of conducting a complete LATR analysis and independently mitigating individual development's traffic impacts.

Silver Spring CBD Bicycle and Pedestrian Priority Area – M-NCPPC, June 2015

This document proposes a Bicycle and Pedestrian Priority Area (BiPPA) for the Silver Spring Central Business District. The objective of the BiPPA is to enhance safe bicycle and pedestrian access to support cohesive neighborhoods, aging infrastructure, and improve long-range connectivity and circulation.

Federal Research Center Master Plan Draft Environmental Impact Statement – GSA-USFDA, February 2018

This document evaluates a new Master Plan for the 130-acre Federal Research Center to accommodate a projected employee population of 18,000. The proposed action includes: development up to an additional 1,191,309 gsf of office space and 557,525 gsf of special/shared use space to support FDA's mission for a total of up to 8,977,671 gsf; 11,709 parking spaces for FDA employees and support staff; 1,615 visitor parking spaces; and reconfiguration of the East Loop Road. The document evaluates installation of traffic adaptive/demand responsive signal systems on US 29, MD 650, and Cherry Hill Rd, changing the AM and PM peak periods cycle length to 150 seconds, and proposes grade separated interchanges at US 29 and Stewart Lane, Tech Road, and Musgrove Road. The EIS also calls for a transit hub near the Federal Research Center, and coordination with Montgomery County and SHA to enhance pedestrian and bicycle connections to and networks.

Countywide Bike Master Plan – MCDOT, May 2018

The Bicycle Master Plan sets forth a vision for Montgomery County as a world-class bicycling community, where people in all areas of the county have access to a comfortable, safe, and connected bicycle network, and where bicycling is a viable transportation option that improves the quality of life.

A number of new bikeways are recommended in the study area including a separated bikeway from Northwest Branch to Lorain Ave and from University Blvd to the I-495 bridge on the east side of US 29 as part of the Burtonsville to Silver Spring Breezeway. A separated bikeway is also recommended from Sandy Spring Road (MD 198) to Blackburn Road on the east side and from Tech Road to Rachel Carson Greenway on the west side of US 29.

Existing Roadway Conditions and Traffic Operations

Roadway Characteristics

The roadway classification of US 29 changes from a principal arterial with traffic signals in the southern portion around Silver Spring and White Oak to a limited-access highway north of MD 650. The typical cross section along the US 29 corridor varies between four-lane, five-lane, and six-lane sections with additional turn and merge/diverge lanes. A reversible-lane segment extends approximately one mile from the MD 97 (Georgia Avenue) intersection to just south of the Sligo Creek Parkway intersection. This section, south of Sligo Creek Parkway, is undivided, while the section north of Sligo Creek Parkway is divided using a combination of curb and grass medians, with breaks at intersections along the US 29 corridor.

Traffic Volumes and Travel Times

The Average Daily Traffic (ADT) and travel times vary along the US 29 study corridor. Vehicular ADT ranges between 65,000 and 70,000 vehicles per day, and there are roughly 7,000 – 8,000 bus passengers per day. The peak direction of traffic flow is southbound during the AM peak and northbound in the PM peak. Passenger vehicle travel times in the corridor from Tech Road to Georgia Avenue range from under 15 minutes in the off-peak direction to over 25 minutes in the peak direction. Express buses operate only in the peak directions with travel times no more than 5 minutes greater than those for passenger vehicles, while local buses operate in both directions with travel times approximately 10 minutes greater than those for passenger vehicles.







					
Pedestrians	Bikes	Bus Passengers	Automobiles	Vehicles with 2+ Persons	Trucks
Daily					
1,500-2,000	25-75	7,000-8,000	65,000-70,000	N/A	1,000-1,500
Peak Hour					
100-150	0-10	800-1000	5,000-6,000	N/A	25-125
Peak Hour (Directional)					
N/A	N/A	700-800	3,000-4,000	600	10-75

Figure 5 2018 US 29 Traffic Volumes by Mode

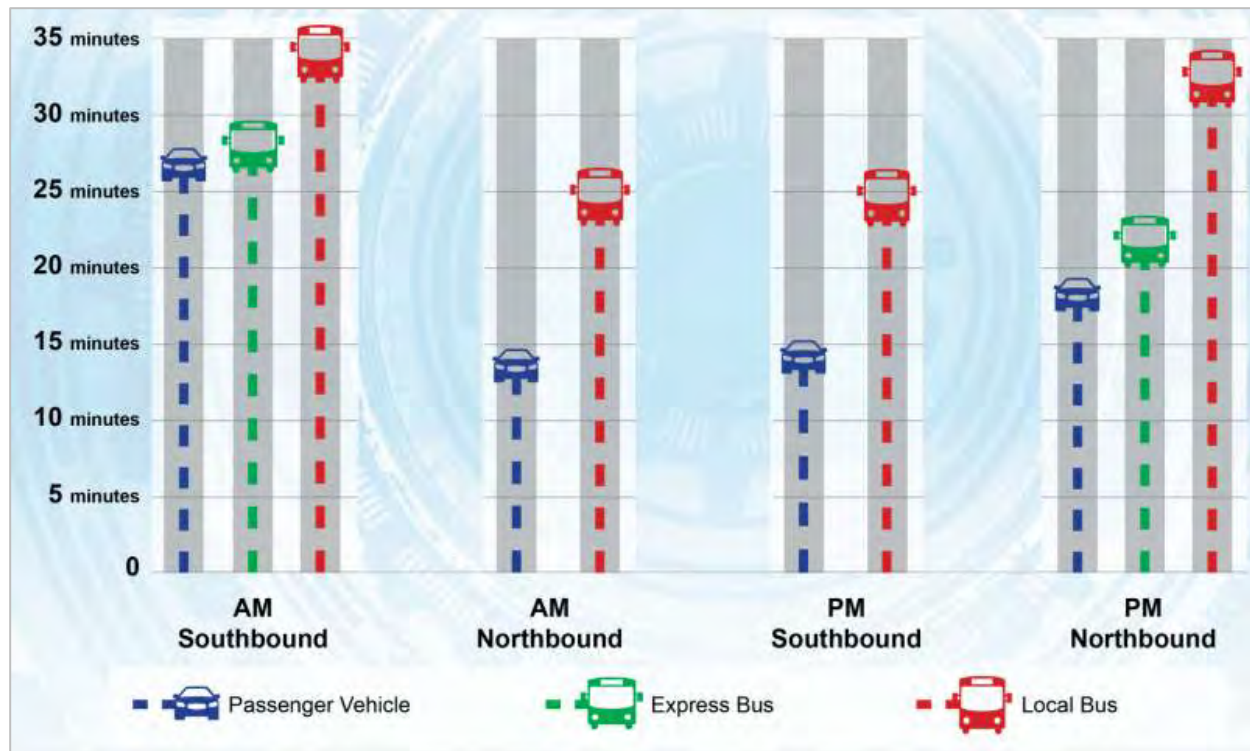


Figure 6. Existing Travel Times by Mode from Tech Road to Georgia Avenue (Sources: INRIX, WMATA and Ride ON AVL and field measured GPS)

Turning movement counts were developed for all study intersections along the corridor. The most recent counts were downloaded from the State Highway Administration's (SHA) Internet Traffic Monitoring System (I-TMS). Other sources of data, including previous reports of the US 29 corridor, were also used if collected more recently.

The raw intersection counts were then balanced between intersections and interchanges using a zero-balancing approach. This method disregards minor driveway volumes between intersections and assumes a zero difference between intersections. Peak hour volumes were rounded to the nearest 5 vehicles.

Appendix I displays balanced peak hour turning movement counts for the study intersections.

Model Development and Calibration

The intersections in the study area were coded into a Synchro network to perform capacity analysis. Synchro is a deterministic and macroscopic signal analysis computer software program that models street networks and traffic signal systems. Geometric data such as number of lanes, lane configuration, storage lengths, tapers, and distances between intersections were input into Synchro. Additionally, existing signal timings and phasing were obtained from Montgomery County Department of Transportation. These timings were coded into a Synchro traffic model along with existing traffic volumes. The model was calibrated to match field verified conditions.

Synchro software and the National Academy of Science's Transportation Research Board *Highway Capacity Manual* (HCM) methodology do not account for the potential impacts of upstream or downstream bottlenecks at intersections or on freeway segments/junctions (i.e. merge, diverge, weaving areas). Therefore, VISSIM, a microsimulation tool, was utilized to evaluate the overall operations of the corridor and the interaction between segments/roadways. The VISSIM model can account for these impacts and can also model specific transit inputs (i.e. BRT) that Synchro cannot. The VISSIM results reflect the impact

of adjacent signals, ramp terminals, junctions, etc. on each analysis segment/point and identify areas plagued by heavy congestion, long queues, and/or slow speeds. The microsimulation traffic analysis in VISSIM was conducted according MDOT-SHA coding and calibration guidelines. A base VISSIM model was developed using existing scaled aerial photography for the project Study Area. The existing AM and PM peak hour volumes and lane configurations were then input in VISSIM.

To confirm the calibration of the model, the simulated traffic volumes, speeds, and travel times along US 29 were compared to the INRIX (Fall 2017) and field collected data (Spring 2017). Default parameters were changed as needed during calibration to ensure model outputs were within the accepted model calibration thresholds.

Modeled Measures of Effectiveness

Intersection capacity analyses were performed using the industry HCM methodology. Synchro implements HCM methods of analysis, which were used for the intersection capacity analysis of all study intersections during weekday AM and PM peak hours.

Performance measures of effectiveness from the Synchro model include level of service (LOS), volume-to-capacity (v/c) ratio, and average vehicle delay. Key performance measures are defined as follows:

Level of Service (LOS) is a qualitative measure describing operational conditions of an intersection or any other transportation facility. LOS measures the quality of traffic service, and may be determined for intersections, roadway segments, or arterial corridors on the basis of delay, congested speed, volume to capacity (v/c) ratio, or vehicle density by functional class. At intersections, LOS is a letter designation that corresponds to a certain range of roadway operating conditions. The levels of service range from 'A' to 'F', with 'A' indicating the best operating conditions and 'F' indicating the worst, or a failing, operating condition.

The volume-to-capacity ratio (v/c ratio) is the ratio of current flow rate to the capacity of the intersection. This ratio is often used to determine how sufficient capacity is on a given roadway. Generally speaking, a ratio of 1.0 indicates that the roadway is operating at capacity. A ratio of greater than 1.0 indicates that the facility is operating above capacity as the number of vehicles exceeds the roadway capacity.

Delay (Control delay) is the portion of delay attributed to traffic signal operation for signalized intersections. Control delay (overall delay) can be categorized into deceleration delay, stopped delay, and acceleration delay.

Additional metrics include **travel time** and **person throughput**. Person throughput is defined as the number of distinct persons able to travel the system/network during the analysis period. Typical person-throughput by mode per lane per hour is shown in **Figure 7**. It should be noted that the parts of US 29 which operate as a limited access expressway and display higher vehicle occupancy rates could have slightly higher motor vehicle person throughputs.

Table 4 and **Table 5** show each Level of Service and their corresponding delay values for signalized and unsignalized intersections, respectively. Detailed capacity analysis worksheets and outputs are included in **Appendix II** for existing and future conditions

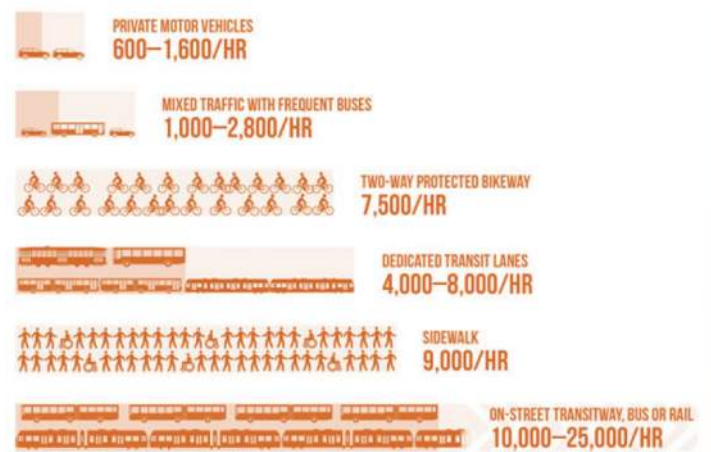


Figure 7. Person throughput illustration

Table 4. Signalized Intersection Level of Service Delay Ranges

Signalized Intersections		
Level of service	Delay range (sec)	General Description
A	≤ 10	Free Flow
B	>10 and ≤ 20	Stable Flow (slight delays)
C	>20 and ≤ 35	Stable Flow (acceptable delays)
D	>35 and ≤ 55	Approaching Unstable Flow (high delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 and ≤ 80	Unstable Flow (excessive delay)
F	>80	Forced Flow (congested and queues fail to clear)

Table 5. Unsignalized Intersection Level of Service Delay Ranges

Unsignalized Intersections	
Level of service	Delay range (sec)
A	≤ 10
B	>10 and ≤ 15
C	>15 and ≤ 25
D	>25 and ≤ 35
E	>35 and ≤ 50
F	>50

Key measures of effectiveness from VISSIM evaluated for this study include travel times (minutes), speeds (mph) and throughput (vehicles/hour) which is then converted to person throughput using average vehicle occupancy.

Roadway Congestion and Safety

The US 29 corridor is characterized by variable traffic volumes and associated congestion (depending on location within the corridor) that hinders both general vehicle and transit bus mobility and results in unpredictable travel times and unreliable transit service. The congestion is most prevalent south of MD 650, particularly around MD 193 (Four Corners), I-495 and downtown Silver Spring. This congestion also frequently causes existing Metrobus and Ride On bus services on US 29 to operate behind schedule.

Roadway congestion presents a daily reminder of the high levels of activity that define this corridor, and the congestion is anticipated to worsen as growth and economic development continue to expand in the corridor and the region. Several roadway sections in the US 29 corridor exceed their volume to capacity ratio to the point that they are considered as “unstable and Breakdown flow” sections. There are several intersections and roadway sections that operate at Level of Service (LOS) F. This represents very poor existing traffic operations for the corridor that lead to extended and more variable travel times and vehicles detouring to other facilities.

Based on the Synchro/HCM analysis **Table 6** summarizes the intersections which operate with a LOS E or LOS F during at least one peak hour:

Table 6: Existing Failing Intersections

Intersection	LOS	
	AM	PM
US 29 & Blackburn Rd	-	-
US 29 & Greencastle Rd	F	F
US 29 & Fairland Rd	-	-
US 29 & Musgrove Road	-	-
US 29 & Tech Rd	F	F
US 29 & Industrial Parkway	-	-
US 29 & Milestone Drive/Stewart Lane	-	-
US 29 & Prelude Drive	-	-
US 29 & Burnt Mills Avenue	-	-
US 29 & Lockwood Drive	-	-
US 29 & Burnt Mills Shopping Ctr	-	F
US 29 & Southwood Ave	E	-
US 29 & MD 193 Eastbound	-	-
US 29 & Lanark Way	-	-
US 29 & Franklin Ave	-	-
US 29 & Sligo Creek Parkway & St. Andrews Way	F	F
US 29 & MD 391 (Dale Dr)	F	F
US 29 & Spring St	F	-
US 29 & Fenton St	-	-
Colesville Rd & 2nd Ave/Wayne Ave	-	-

In addition to failing intersections several segments also experience failing link level of service. Some of these failing links are due to intersection operations while others are due to congestion at ramp merge/diverge areas with intersecting corridors (e.g. I-495). The link levels of service are based on percent of base free-flow speed and were calculated from the VISSIM model outputs. **Table 7** summarizes the failing segments during at least one peak hour.

Table 7: Existing Failing Segments

		LOS			
US 29 Segment Limits		AM		PM	
North	South	SB	NB	SB	NB
Blackburn Rd	Greencastle Rd	-	-	-	-
Greencastle Rd	Fairland Rd	-	-	-	-
Fairland Rd	Musgrove Rd	-	-	-	-
Musgrove Rd	Tech Rd	F	-	-	-
Tech Rd	Industrial Pkwy	-	F	-	F
Industrial Pkwy	Stewart Ln Slip Ramp	F	-	-	-
Stewart Ln Slip Ramp	Stewart Ln	F	-	-	-
Stewart Ln	Prelude Dr	F	-	-	-
Prelude Dr	Burnt Mills Ave	F	-	-	-
Burnt Mills Ave	Lockwood Dr	F	-	-	-
Lockwood Dr	Burnt Mills SC	F	-	-	-
Burnt Mills SC	Southwood Ave	F	-	-	E
Southwood Ave	MD 193 WB	F	-	-	-
MD 193 WB	MD 193 EB	F	-	-	-
MD 193 EB	Lanark Way	-	-	-	E
Lanark Way	N. 495 Interchange	-	-	-	-
Franklin Ave	Sligo Creek Pkwy	E	-	F	-
Sligo Creek Pkwy	Dale Dr	-	-	F	F
Dale Dr	Spring St	-	-	-	F
Spring St	Fenton St	-	F	E-	E
Fenton St	Georgia Ave	-	-	E	-
Georgia Avenue	Wayne Avenue	F	F	F	F

Other performance measures such as travel times and vehicle throughput were output from the calibrated existing VISSIM models. Person-throughput was subsequently calculated from the vehicle throughput. These are summarized in **Table 8 and Table 9**, respectively. The model results are consistent with the results shown in the *Traffic Volumes and Travel Times* section above.

The 'Time to Enter' value is the calculated additional delay to account for vehicles on US 29 that are delayed outside of the corridor endpoints due to congestion/queues extending beyond these endpoints.

Table 8. VISSIM Modeled Travel Times from MD 198 to Georgia Avenue

Passenger Vehicle Travel Times (min) - AM Peak Hour			
US 29 - Southbound		US 29 - Northbound	
Segment	Existing Conditions	Segment	Existing Conditions
Time to Enter ¹	2.7	Greencastle to MD 198	1.3
MD 198 to Greencastle	2.8	Fairland to Greencastle	2.3
Greencastle to Fairland	2.3	Cherry Hill to Fairland	1.7
Fairland to Cherry Hill	1.5	MD 650 to Cherry Hill	3.4
Cherry Hill to MD 650	7.2	MD 193 to MD 650	3.5
MD 650 to MD 193	11.9	Franklin to MD 193	1.5
MD 193 to Franklin	1.8	Georgia to Franklin	4.5
Franklin to Georgia	4.1	Time to Enter ¹	4.8
Total	34.3	Total	23.1

Passenger Vehicle Travel Times (min) - PM Peak Hour			
US 29 - Southbound		US 29 - Northbound	
Segment	Existing Conditions	Segment	Existing Conditions
Time to Enter ¹	0.9	Greencastle to MD 198	1.1
MD 198 to Greencastle	1.6	Fairland to Greencastle	3.7
Greencastle to Fairland	2.6	Cherry Hill to Fairland	1.4
Fairland to Cherry Hill	1.6	MD 650 to Cherry Hill	4.4
Cherry Hill to MD 650	3.2	MD 193 to MD 650	5.3
MD 650 to MD 193	4.1	Franklin to MD 193	1.9
MD 193 to Franklin	1.5	Georgia to Franklin	5.6
Franklin to Georgia	4.8	Time to Enter ¹	8.1
Total	20.3	Total	31.4

*Time to enter includes the delay for vehicles waiting to enter the corridor

Table 9. VISSIM Modeled Person Throughput

AM Peak Hour					
Location	Existing Conditions				
	Vehicle Throughput		Person Throughout		
	Passenger Cars	Buses	Passenger Cars	Buses	Total
Southbound					
South of Blackburn	3700	8	4250	250	4500
South of Musgrove	3400	16	3900	475	4375
South of Industrial	2950	26	3400	775	4175
South of Lockwood	3275	32	3775	950	4725
South of MD 193	3475	35	4000	1050	5050
South of Hastings	2500	35	2875	1050	3925
South of Dale Dr	2425	43	2800	1300	4100
Northbound					
South of Blackburn	2500	0	2875	0	2875
South of Musgrove	1875	0	2150	0	2150
South of Industrial	2025	5	2325	150	2475
South of Lockwood	2025	10	2325	300	2625
South of MD 193	1600	12	1850	350	2200
South of Hastings	1600	12	1850	350	2200
South of Dale Dr	1050	18	1200	550	1750
PM Peak Hour					
Location	Existing Conditions				
	Vehicle Throughput		Person Throughout		
	Passenger Cars	Buses	Passenger Cars	Buses	Total
Southbound					
South of Blackburn	2700	0	3100	0	3100
South of Musgrove	2075	0	2375	0	2375
South of Industrial	2425	5	2800	150	2950
South of Lockwood	2425	11	2800	325	3125
South of MD 193	2100	14	2425	425	2850
South of Hastings	1675	14	1925	425	2350
South of Dale Dr	1325	18	1525	550	2075
Northbound					
South of Blackburn	3025	8	3475	250	3725
South of Musgrove	3150	15	3625	450	4075
South of Industrial	3100	18	3575	550	4125
South of Lockwood	3425	24	3950	725	4675
South of MD 193	3075	27	3525	800	4325
South of Hastings	3075	27	3525	800	4325
South of Dale Dr	2425	34	2800	1025	3825

Throughput calculations assumed an average vehicle occupancy of 1.15 persons per passenger vehicle and 75% occupancy of buses (based on performance data collected as part of the US 29 TIGER FLASH grant application) with a maximum average capacity of 40 persons per bus. During the morning peak hour, modeled person throughput varies between 4,000 and 5,000 persons in the peak southbound direction and 1,750 and 3,000 in the off-peak northbound direction. During the evening peak hour, modeled person throughput varies between 3,800 and 4,700 in the peak northbound direction and 2,000 and 3,100 in the off-peak southbound direction.

US 29 Mobility & Reliability Study Technical Report

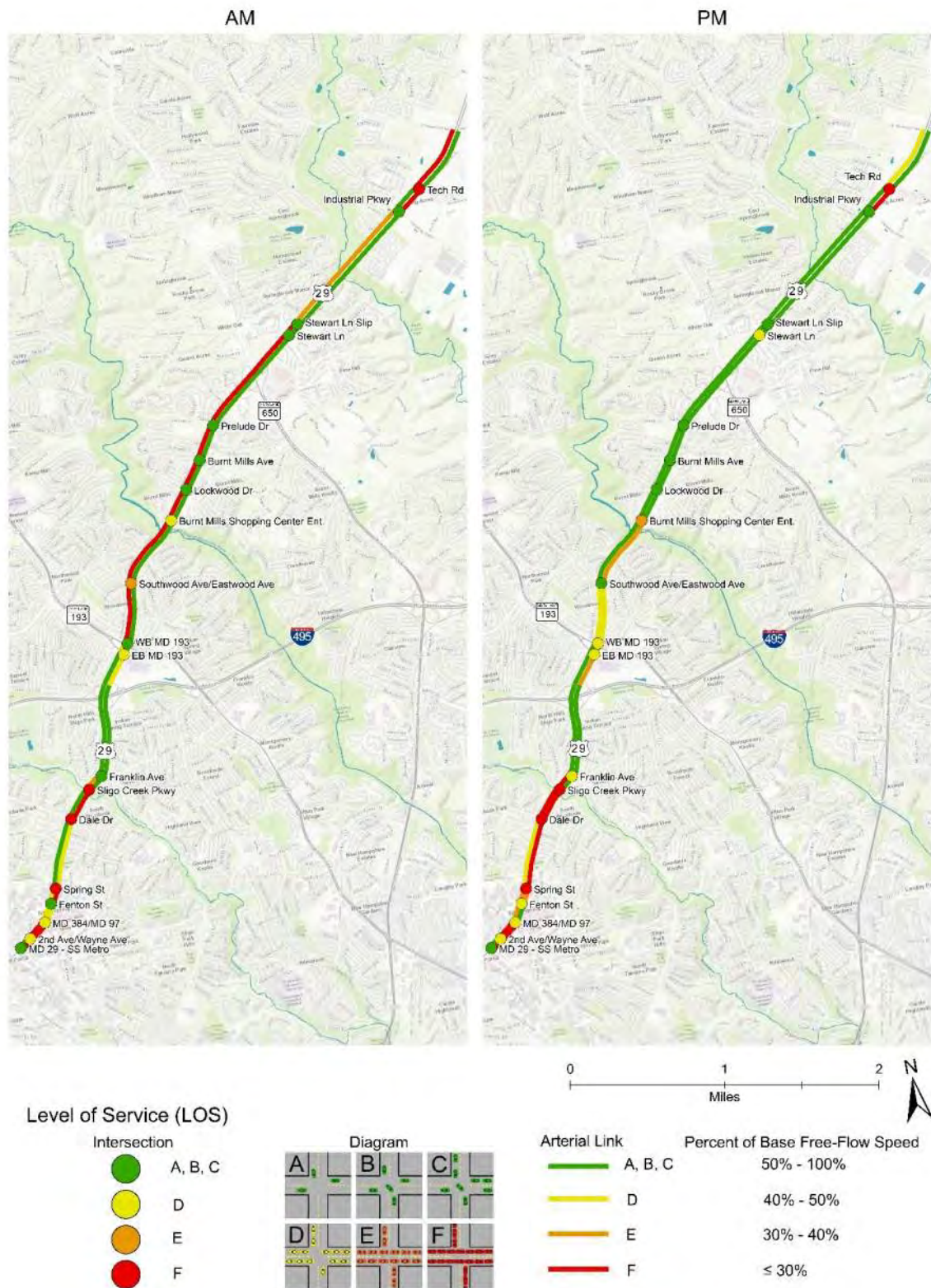


Figure 8 – Existing Conditions Level of Service

Transit Conditions

All current transit service along the US 29 corridor is provided by three operators: Montgomery County Ride On, Washington Metropolitan Area Transit Authority (WMATA) Metrobus Z-line bus, and the MDOT MTA Commuter Bus. WMATA provides Metrorail Red Line service at the Silver Spring Station, which is near the Silver Spring Transit Center.

The Transit Center serves as a hub for the Metrorail, MARC, Ride On, Metrobus, and local shuttle services. It is also a future stop for the Purple Line Light Rail. The MTA MARC Brunswick Commuter Rail Line stops in Silver Spring are less than a block away from the Metrorail station.

Montgomery County Ride On Bus

Montgomery County Ride On bus service covers portions of the US 29 corridor. Four of the routes, the 8, 9, 10, and 14 generally make frequent, all day stops within the corridor and operate at headways ranging from 20-30 minutes. Routes 13, 21 and 22, operate on a limited peak period schedule with headways ranging from 25-30 minutes, providing service during weekday morning and evening peak travel times with no mid-day/off peak service.

Metrobus

The Z- line buses are mostly weekday services, except for Z8. Several are peak services only, including Z2, Z9/Z29, and Z11/Z13. The Z2, Z6, and Z8 lines provide all day local service, while Z9/Z29 and Z11/Z13 provides limited stop express service with no off-peak services.

The Z-lines serve the area between Silver Spring Transit Center and Lockwood Drive/New Hampshire Avenue and offer a combined average service headway of 10 minutes in the a.m. peak period (6 a.m. to 9 a.m.) and six to seven minutes in the p.m. peak (4 p.m. to 7 p.m.). The combined average service headway declines farther north; 15 minutes in the a.m. and eight-and-a-half minutes in the p.m. from Lockwood Drive/New Hampshire Avenue to US 29 and Industrial Parkway, and 30 minutes north of Industrial Parkway.

Metrorail

The Silver Spring Metrorail Red Line Station is located at the south end of the study corridor. The other Metrorail stations close to the study area include Forest Glen, Glenmont, and Wheaton. The Red Line is the busiest Metrorail line running through downtown DC and connecting Montgomery County and downtown DC. The U-shaped Red Line alignment is approximately 31.9 miles long from Shady Grove to Glenmont and crosses perpendicular to US 29 on the east leg of its rail alignment. The Red Line has frequent service during the weekday rush hours, and it provides reasonably frequent services during off-peak hours and weekends.

FLASH

Beginning in late 2020, the County will initiate FLASH premium bus service with 11 stations. The service will use existing bus-on-shoulder lanes on US 29 in the northern section of the corridor. In other sections, it will operate in mixed traffic as well as along portions of Lockwood Drive, Stewart Lane, Briggs Chaney Road, and Castle Boulevard. Service plans include two route patterns running every 7.5 minutes during the peak period (AM and PM rush hours) and every 15 minutes during the off-peak. The span of service is from 5 am to midnight, 7 days/week. Figure 9 illustrates the existing transit routes. Proposed FLASH service routes are shown in the inset map.

Table 10 summarizes existing transit service providers, route miles and stops within and crossing the US 29 corridor. Tables 11 and 12 summarize Ride On and WMATA ridership by route, segmented within the study area and along US 29 proper.

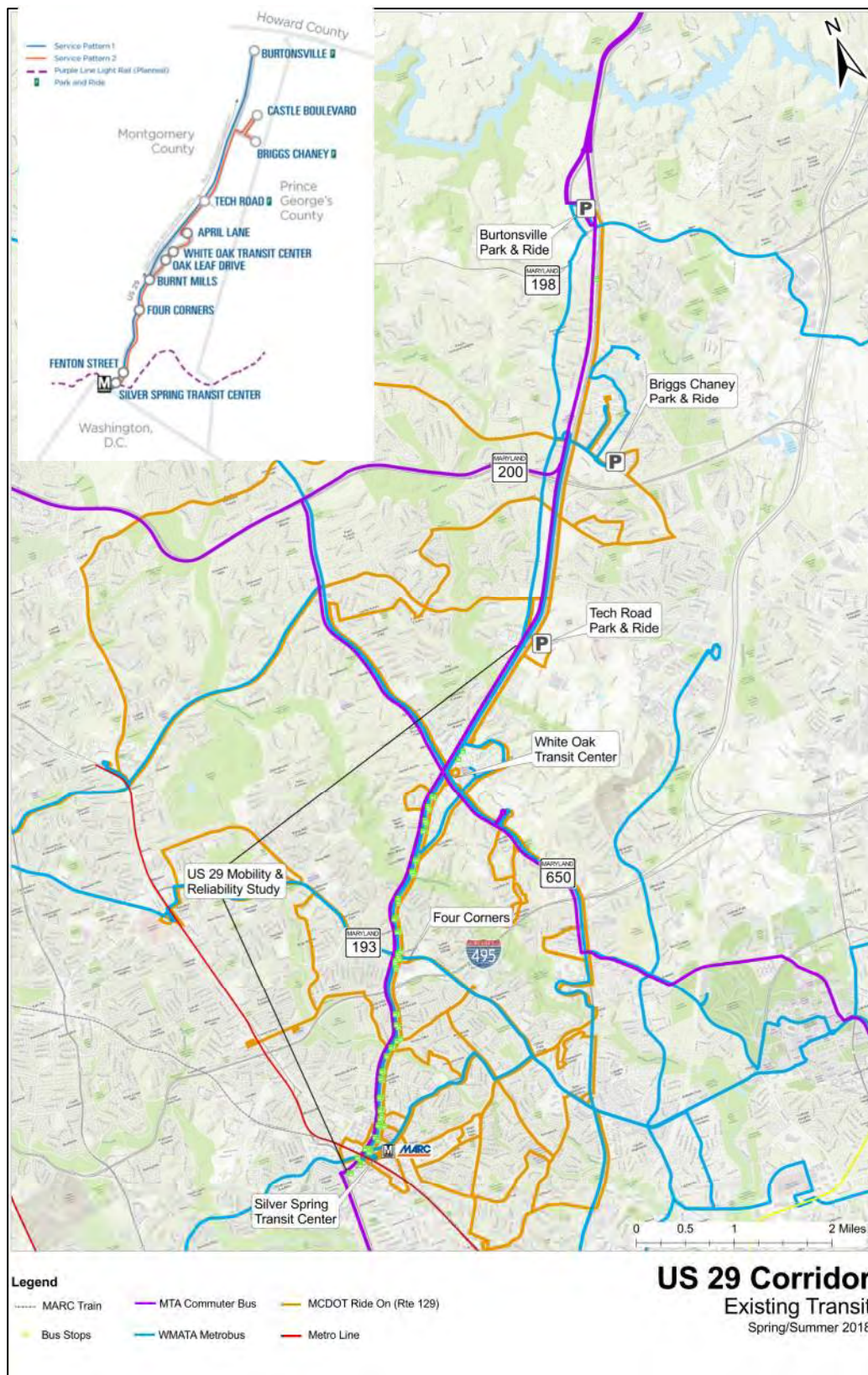


Figure 9. Existing US 29 Corridor Transit Services

Table 10. Existing Transit Operations along US 29 Corridor

		Route Miles within Corridor	Stops/ Stations within Corridor
Serving US 29 Corridor			
Ride On			
8	SSTC to Sligo Creek Pkwy	1.27	15
9	SSTC to MD 193	2.28	22
12	SSTC to at Spring St.	0.61	6
13	SSTC to Sligo Creek Pkwy	1.29	15
14	On US 29 at Franklin Ave.	1.47	16
21	SSTC to MD 650	4.98	43
22	SSTC to MD 650	4.66	45
129	Started in May 2018 SSTC to Burtonsville	13.25	25
WMATA			
Z2	SSTC to MD 650	4.54	53
Z6	SSTC to Tech Rd & Briggs Chaney to Burtonsville	11.56	110
Z7	SSTC to Briggs Chaney	11.19	61
Z8	SSTC to Burtonsville	11.91	113
Z11	SSTC to Briggs Chaney, Green Castle, Burtonsville	12.03	34
MTA			
305	Burtonsville to SSTC and DC Core	10.73	5
315	On US 29: Burtonsville to SSTC and DC Core	10.60	5
325	On US 29: Burtonsville to SSTC and DC Core	10.10	4
Primarily Service Crossing US 29			
Ride On			
10	No stops on 29, Stops at Tech Road & Lockwood Dr.	3.33	19
16	On US 29: Georgia to Fenton	0.64	3
17	On US 29: Georgia to Fenton	0.50	3
20	On US 29: Georgia to Fenton	0.62	4
WMATA			
F4	On US 29: Georgia to SSTC	0.5	5

Table 11. RideOn Ridership

	Within Study Area		On US 29/ FLASH alignment		Total	
	Boardings	Alightings	Boardings	Alightings	Boardings	Alightings
Weekday Ridership (Routes serving US 29/ FLASH route)						
8	85	114	191	167	276	281
9	262	233	352	359	614	592
12	259	310	262	194	520	504
129			255	208	255	208
13	54	54	48	63	102	117
14	547	609	221	205	768	815
21	108	142	178	144	286	286
22	200	195	283	288	483	483
Total	1,515	1,656	1,789	1,628	3,304	3,284
Weekday Ridership (Routes primarily crossing US 29)						
10	578	631	358	293	936	924
16	1,354	1,206	116	100	1,470	1,306
17	469	437	179	131	648	567
20	2,223	2,325	470	398	2,722	2,723

Table 11. RideOn Ridership (continued)

	Within Study Area		On US 29/ FLASH alignment		Total	
	Boardings	Alightings	Boardings	Alightings	Boardings	Alightings
Saturday Ridership (Routes serving US 29/ FLASH route)						
8	37	43	141	130	178	173
9	139	128	215	224	354	352
12	151	186	148	119	298	305
14	232	225	97	107	329	332
Total	559	581	601	580	1,159	1,161
Saturday Ridership (Routes primarily crossing US 29)						
10	386.63	400.12	253.66	214.71	640.29	614.83
16	1,263	1,107	91	83	1,353	1,190
17	238	230	110	82	348	312
20	1,672	1,727	295	240	1,967	1,967
Total	3,556	3,464	750	620	4,309	4,084
Sunday Ridership (Routes serving US 29/ FLASH route)						
9	140.18	136.62	239.92	248.32	380.10	384.94
12	163.88	197.27	165.58	116.94	329.46	314.21
Total	304.06	333.89	405.50	365.26	709.56	699.15
Sunday Ridership (Routes primarily crossing US 29)						
10	436	421	315	238	751	658
16	976	845	82	75	1,058	920
17	167	177	90	56	257	233
20	1,255	1,293	236	198	1,490	1,491
Total	2,834	2,736	723	566	3,557	3,303

Table 12. WMATA Ridership

	Within Study Area		On US 29/ FLASH alignment		Total	
	Boardings	Alightings	Boardings	Boardings	Alightings	Boardings
Weekday Ridership (Routes serving US 29/ FLASH route)						
Z11	105	66	706	745	811	811
Z2	157	193	425	386	582	579
Z6	496	430	1,977	2,044	2,473	2,473
Z7	18	18	327	342	345	360
Z8	83	71	2,749	2,761	2,832	2,832
Total	859	777	6,185	6,278	7,044	7,055
Weekday Ridership (Routes primarily crossing US 29)						
F4	625.78	621.37	495.39	590.21	1,121.17	1,211.58
Saturday Ridership (Routes serving US 29/ FLASH route)						
Z11	3	1	19	20	22	22
Z6	311	258	1,485	1,538	1,796	1,796
Z7	1	1	10	10	11	11
Z8	2	5	2,245	2,242	2,247	2,247
Total	317	265	3,760	3,810	4,076	4,076
Saturday Ridership (Routes primarily crossing US 29)						
F4	374	368	333	374	706	374
Sunday Ridership (Routes serving US 29/ FLASH route)						
Z8	1	5	2,644	2,640	2,645	2,645
Sunday Ridership (Routes primarily crossing US 29)						
F4	229	216	239	247	2,434	2,434

Existing FLASH Station Accessibility

This section of the report documents existing walking and biking conditions including gaps and barriers, land use, key connections, location and quality of existing bicycle facilities, and planned bicycle facilities at the stations between Silver Spring and Tech Road.

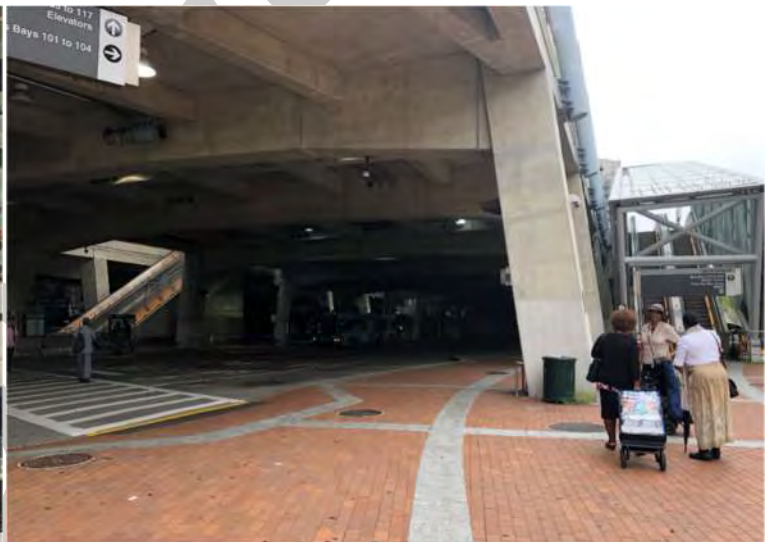
Station 1 – Silver Spring Transit Center

Station 1 is located inside the Silver Spring Transit Center, a transportation hub connecting a Metrorail station, MARC train station and 20 Montgomery County Ride On and 24 Metrobus bus stops as well as routes for FDA Shuttle, University of Maryland shuttle, MetroAccess and Intercity Buses. The site will also include a station location for the new Purple Line, to be constructed between the Silver Spring Transit Center and the corner of US 29 and Wayne Avenue, slated for completion in 2022. The transit center is located in the area bounded by US 29, Wayne Avenue, Ramsey Avenue, Ripley Street, and the MARC tracks. The BRT station will be located in the northernmost portion of the transit center's second level.

Development Patterns



BRT Station Location



Ground Level of Silver Spring Transit Center

The area within a half mile radius of Station 1 is characterized by commercial land use, primarily retail and office use with some residential use. Multi-family residential buildings are present on the main corridor while single family detached housing is located away from US 29. The station is located in downtown Silver Spring, a central business district that includes an arts and entertainment district. NOAA's Silver Spring campus, a four-building complex housing 80 percent of the agency's Washington-area employees, is located adjacent to the Silver Spring Transit Center. Maryland Department of Parole and Probation – Silver Spring Field Office is also located in Downtown Silver Spring, and the Silver Spring Civic Building, District Court for Montgomery County, Silver Spring Library and Fire Station are located within the half-mile radius of Station 1.

According to UrbanTurf, four future developments in Downtown Silver Spring will result in the construction of 18,181 residential units, 137,000 square feet of publicly owned and operated spaces, 140,150 square feet of public use and amenities, and 64,200 square feet of retail space.

Key Connections

Due to the status of this location as a major transportation hub and the high number of pedestrian generators in the area, accessible pedestrian connectivity is of utmost importance. Downtown Silver Spring streets have wide sidewalks for the most part, accommodating pedestrian traffic well. Sidewalks on Georgia Avenue and US 29 are approximately 20 feet wide and narrower side streets have 10 feet wide sidewalks. With a major transit hub surrounded by more than 5,000 dwelling units and 7 million square feet of office space, US 29, 2nd Avenue, Wayne Avenue, East-West Highway and Fenton Street should accommodate pedestrians and have facilities to ensure safe pedestrian crossings. Although the sidewalk infrastructure is present and provides adequate space for pedestrians, crosswalk improvements are necessary for a better connectivity and safer pedestrian environment. The improvements will help a more accessible path between the Silver Spring Transit Center and the NOAA buildings and destinations on East West Highway, such as the Blair Park Shopping Center. Improved pedestrian accessibility to south of the Metro Platform also creates a better connection between the transit station and the neighborhoods of Colonial Village and Shepherd Park in northeast Washington D.C. Pedestrian friendly crosswalks with medians in the downtown Silver Spring core encourages walking to local retail and community amenities such as the Silver Spring Public Library and the AFI Cinema. Expanding and improving the pedestrian network north of downtown Silver Spring provides connectivity to the Woodside Park neighborhood.

Bicycle Access

Low stress¹ bicycle routes (appropriate for children and novice riders) that provide access between FLASH stations and local destinations are summarized. In addition, existing bicycle facilities, projects under development, and planned facilities within each station area are listed.

Current very low stress bicycle routes include Spring Street parallel to Colesville Road and 2nd Avenue perpendicular to Colesville Road

Existing Facilities

- Separated bike lanes intersecting Colesville Road on 2nd Avenue

Capital Projects

- Dixon Ave Separated Bike Lanes
- Metropolitan Branch Trail Phase 2

Planned Facilities

The Montgomery County Bicycle Master Plan recommends many improvements in the Downtown Silver Spring area in order to provide safe and defined routes for bicyclists. The area is less than half a mile to the border of Washington D.C. and within a mile of the Montgomery College Takoma Park campus, a number of parks such as Jessup Blair Local Park, Acorn Park, and other neighborhood parks in Maryland as well as Rock Creek Park in Washington D.C.

- Separated bike lanes along Colesville Road between 16th St and Georgia Ave
- Separated bike lanes intersecting Colesville Road on MD 410

¹ As defined by Montgomery County's modified Bike LTS methodology
(<https://mcatlas.org/bikestress/documentation/ModifiedLevelOfTrafficStressMethodology.pdf>)

Station 2 – Fenton Street

Station 2 is located on US 29 near Fenton Street. The northbound stop is located south of Fenton Street (near-side of the intersection) and the southbound stop is located north of Fenton Street (near-side of the intersection). The proposed northbound BRT station is collocated with an existing bus stop serving five WMATA routes, eleven RideOn routes and four MTA Commuter Bus routes. The northbound bus stop has an existing bus shelter. The southbound BRT station at Fenton Street is a new location south of an existing far-side bus stop on US 29 near Spring Street.



BRT Station Locations



Northbound (above) and Southbound BRT Station Locations

Development Patterns

The area within a half mile radius of Station 2 is characterized by commercial and residential land use, primarily retail and multi-family and single-family residential units. Multi-family residential buildings are present on the main corridor closer to the station and to the south, while single-family detached housing is located further north off of US 29 and on local streets away from US 29. The station is located in downtown Silver Spring, a central business district that includes an arts and entertainment district. The AFI Silver Theatre, a 675-seat cinema, is located adjacent to the proposed northbound station location. Hotels and apartments are located near the proposed southbound bus station location. Two biotechnology companies are within a block of the Fenton Street BRT Station. The Silver Spring Civic Building, District Court for Montgomery County, Silver Spring Library and Fire Station are located within the half-mile radius of Station 2. Maryland Department of Parole and Probation – Silver Spring Field Office is also located in Downtown Silver Spring. NOAA's Silver Spring campus, a four-building complex housing 80 percent of the agency's Washington-area employees, is located within a half mile radius of Station 2.

According to UrbanTurf, four future developments in Downtown Silver Spring will result in the construction of 1,818 residential units, 137,000 square feet of publicly owned and operated spaces, 140,150 square feet of public use and amenities, and 64,200 square feet of retail space.

Key Connections

Due to the close proximity to mixed-use developments with both day and night uses, and the high number of pedestrian generators in the area, accessible pedestrian connectivity is critical. Downtown Silver Spring streets have wide sidewalks for the most part, accommodating pedestrian traffic well. Sidewalks on US 29

are approximately 20 feet wide and side streets have 10 feet wide sidewalks. The sidewalk infrastructure exists in the corridor; however, the condition of these sidewalks need improvement in order to provide an accessible pedestrian environment for all users. Expanding the network of sidewalks and improving crosswalks near Station 2 improves the quality of walkability in downtown Silver Spring. Fenton Street and its surrounding area has a diverse foot traffic generated by employees in the area, those traveling to the commercial corridor and Silver Spring residents. Pedestrian-friendly crosswalks with medians in the downtown Silver Spring core encourages walking to local retail and community amenities, such as the Silver Spring Public Library and the AFI Cinema. Expanding and improving the pedestrian network north of downtown Silver Spring provides connectivity to the Woodside Park neighborhood.

Bicycle Access

Current very low stress bicycle routes include Alton Parkway and Ellsworth Drive parallel to US 29 and Spring Street perpendicular to US 29.

Existing Facilities

- Separated bike lanes intersecting US 29 at Spring Street/Cedar Street

Capital Projects

- Cameron Street to Planning Place Bikeway
- Fenton Street Bikeway
- Dale Drive Shared-Use Pathway

Planned Facilities

The Montgomery County Bicycle Master Plan recommends many improvements in the Downtown Silver Spring area to provide safe and defined routes for bicyclists. The area is less than half a mile to the Silver Spring Transit Center and the NOAA Headquarters, and within a mile to the border of Washington D.C. and a number of parks such as Nolte Local Park and Sligo Creek Golf Course, Bullis Park and two schools, the Silver Spring International Middle School and the Sligo Creek Elementary School.

- Neighborhood greenways parallel to US 29 on Alton Parkway and Ellsworth Drive

Station 3 – University Boulevard

Station 3 is located on US 29 near University Boulevard. The northbound stop is located south of University Boulevard across from Lanark Way, backing Montgomery Blair High School. The proposed northbound BRT station is collocated with an existing bus stop serving three Metrobus routes and two Montgomery County RideOn routes. The southbound stop is located on US 29 north of University Boulevard and south of Timberwood Avenue. The southbound BRT station at University Boulevard is collocated with an existing stop serving four Metrobus routes. That stop includes an existing bus shelter.



Northbound BRT Station Locations



Southbound BRT Station Locations

Development Patterns

The area within a half mile radius of Station 3 is characterized primarily by residential land use, but also includes a small portion of commercial use and several institutional uses. Small commercial strips are located to the north, east, and west of the intersection of University Boulevard and US 29. Three schools (Montgomery Blair High School, St Bernadette School and Silver Spring Day School) are to the south and east of the intersection, off of University Boulevard. Other community-focused uses, including a YMCA, funeral house, a church and a retirement community are within a half mile of the proposed stations.

No major development plans were found for the area within a half mile radius of Station 3.

Key Connections

Due to the nature of the area, with majority residential development, three schools and a central area with multiple shopping centers, the area surrounding Station 3 should have a well-connected network of accessible pedestrian paths. The area has great potential to encourage pedestrian activity with the correct infrastructure in place.

A comprehensive sidewalk infrastructure exists in the corridor, although the condition of these sidewalks needs improvement in order to provide an accessible pedestrian environment for all users. Sidewalks in the area are generally between five to ten feet wide, although some narrow sidewalks are adjacent to US 29 and University Boulevard with no buffer between the roadway and sidewalks. Sidewalk improvements would benefit students who walk to school, as well as residents in Woodmoor, South Four Corners and Indian Spring Terrace. The retirement community further west on University Boulevard would also benefit from wider sidewalks as the members of this community are less likely to be driving to destinations they are interested in traveling.

Neighborhoods south of I-495 are disconnected from the central commercial area and the future Station 3 location by the highway.

Bicycle Access

Current very low stress bicycle routes include most neighborhood streets in the vicinity of Four Corners, but US 29 and MD 193 (Univ Blvd) are barriers that prevent very low stress access from these streets to other locations in the vicinity of Four Corners.

Existing Facilities

- Sidepath along US 29 and MD 193 (Univ Blvd) on frontage of Montgomery Blair HS

Capital Projects

- Franklin Ave Sidewalks

Planned Facilities

- Sidepaths intersecting US 29 along MD 193 (Univ Blvd)
- Neighborhood greenways parallel to US 29 on Brunett Ave/Southwood Ave and Pierce Drive/Woodmoor Circle (also including short separated bikeway segment along Lexington Dr)

Station 4 – Burnt Mills

Station 4 is located on US 29 south of Lockwood Drive. The northbound stop is adjacent to the Burnt Mills Shopping Center, collocated with an existing bus stop, at the far side of the Shoppes of Burnt Mills Entrance intersection. This bus stop has an existing bus shelter in place. The existing northbound bus stop serves three Metrobus routes and three Montgomery County Ride On routes. The southbound stop is located in front of an office complex collocated with an existing bus stop. This bus stop is at the near-side of the intersection of the Shoppes of Burnt Mills, and serves three Metrobus routes and three Montgomery County Ride On routes.



Northbound BRT Station Location



Southbound BRT Station Location

Development Patterns

The area within a half mile radius of Station 4 is mostly residential with only the immediate surrounding of the station characterized by commercial and office space.

Three medical office buildings on the west side of US 29 are the dominant land use in the immediate vicinity of Station 4. There is also a retail strip located on the east side of US 29, along with two gas stations on the east and west side of the corridor. Other uses in the half mile radius of Station 4 are a Dance School at the corner of Lockwood Drive and US 29, a Hebrew Congregation and Church (both on Lockwood Drive).

The residential land use near the station is primarily single-family homes with a few townhomes and apartment buildings. The Northwest Branch of the Anacostia River separates the neighborhoods of White Oak and Burnt Mills to the north from Northwood Park and Woodmoor to the south.

Key Connections

The area surrounding Station 4 could benefit significantly from having a BRT station and increased pedestrian and bicycle amenities along US 29 in the future. While sidewalks are present on US 29, they are narrow in some areas at around 4 feet wide with no buffer between the pedestrian space and vehicles traveling on US 29. Trails that run perpendicular to US 29 along Northwest Branch seem to have poor connectivity across the river and could be better utilized if the paths crossed the river. Providing residents

a safe pedestrian environment where they are able to walk from the neighborhood to the commercial strip would reduce the need to drive for the short distance. Employees in the office buildings will also benefit with safer connectivity between the two sides of US 29. The disconnected and poor condition sidewalks are also lacking safe intersection crosswalk conditions. In addition to sidewalks along the roads in the area, adding connections from the neighborhood to US 29 would shorten the distance pedestrians need to travel. For example, a well-used dirt path exists between Wheeler Drive and US 29, however it is not ADA accessible and improvements could be made.

Bicycle Access

Current very low stress bicycle routes include most neighborhood streets in the vicinity of Burnt Mills, but US 29 is a barrier that prevents very low stress access from these streets to others. The only very low stress bicycle route to cross US 29 in this area is at Burnt Mills Avenue.

Planned Facilities

The Montgomery County Bicycle Master Plan recommends improvements for Burnt Mills and White Oak in order to provide connectivity for bicyclists along the US 29 corridor and parallel roads that would be lower stress routes for cyclists. Bicycle connectivity would help link Burnt Mills to New Hampshire Avenue and the FDA Headquarters located approximately 2.5 miles north.

- Sidepaths on US 29 and on Lockwood Drive

Station 5 – Oak Leaf Drive

Station 5 is located on Lockwood Drive north of Northwest Drive and south of Oak Leaf Drive. The northbound bus stop is at the far-side of the Northwest Drive on Lockwood Drive. It is collocated at with an existing bus stop serving three Metrobus routes and one Montgomery County Ride On route. There are no bus amenities at this location. The southbound stop is a new bus stop location at the far-side of Oak Leaf Drive.



BRT Station Locations



Northbound BRT Station Locations



Southbound BRT Station Locations

Development Patterns

The area within a half-mile radius of Station 5 is mostly residential. The northeastern portion of the half-mile radius is primarily commercial, and the US FDA campus occupies the easternmost portion of the station environs.

Townhomes and single family residences make up the majority of housing stock in the half-mile radius of the proposed BRT stop. A few large apartment buildings are located further from the proposed station location, near the US 29/New Hampshire Avenue interchange. The White Oak neighborhood in this area is surrounded by multiple uses which result in both day and night activities in the area.

The three institutional land uses in the area are two churches and a Hebrew Congregation on Lockwood Drive. The Burnt Mills Elementary School is located off Northwest Drive west of Columbia Pike.

The 28-acre White Oak Shopping Center is at the northern edge of the Station 5's half-mile walkshed. The shopping center south of Lockwood Drive (across from White Oak Shopping Center) is an office building and a series of ancillary retail uses.

The U.S. Food and Drug Administration White Oak campus is east of New Hampshire Avenue and approximately 8,000 employees work on this campus.

The Commercial area east of New Hampshire Avenue and north of the FDA Campus is planned to be redeveloped. The plan is for a mixed-use walkable center to replace White Oak Shopping Center and open spaces for the communities. The development area is approximately 40 acres and will include residential and commercial uses. This will add some foot traffic and increase the travel destinations near Station 5.

Key Connections

The area surrounding Station 5 could benefit significantly from having proper pedestrian and bicycle amenities due to the existing land uses and the future BRT station. Lockwood Drive has sidewalks; however, the network is a series of different types of sidewalks at various widths. The sidewalk is typically four feet with places that have 10 feet wide sidewalks. The residential streets crossing Lockwood Drive do not have sidewalks for the most part, and those that do have narrow, subpar sidewalks. An elementary school is on Northwest Drive and it is critical to have safe pedestrian routes to the school for elementary school students to comfortably walk to and from school.

Due to the narrower street width on Lockwood Drive than Columbia Pike, encouraging pedestrians to walk on Lockwood Drive parallel to that segment of Columbia Pike would require proper infrastructure. Crosswalks near the proposed BRT Station 5 should be accessible. The intersection of New Hampshire Avenue and Lockwood Drive should be improved for pedestrian safety, due to the wide crossing distances of both streets. Pedestrian improvements are necessary for those who walk to the White Oak Shopping Center.

Bicycle Access

Current very low stress bicycle routes include Northwest Drive intersecting Lockwood Drive, and most other neighborhood streets. However, US 29 and New Hampshire Avenue are barriers that prevent very low stress access from these routes to local destinations.

Planned Facilities

The Montgomery County Bicycle Master Plan recommends improvements for the White Oak area in order to provide connectivity for bicyclists along the US 29 corridor and parallel roads that would be lower stress routes for cyclists. Bicycle connectivity would help link the residential area south of White Oak Shopping Center and the FDA campus with these destinations.

- Sidepaths on US 29 and on Lockwood Drive
- Separated bikeway intersecting Lockwood Drive and US 29 on New Hampshire Avenue

Station 6 – White Oak Transit Center

Station 6 is located on Lockwood Drive east of New Hampshire Avenue and south of the White Oak Shopping Center. The location is currently referred to as the Lockwood Transit Hub and a number of buses use the proposed stop locations. The proposed northbound and southbound BRT stations are co-located



Planned BRT Station Platform Locations



Planned Southbound BRT Station Location

with existing bus stops that serve three Metrobus routes and one Montgomery County RideOn route.

Another bus station is located approximately 400 feet east of the proposed BRT bus stops. Both existing stations have bus shelters.



Planned Northbound BRT Station Location

Development Patterns

The area within a half mile radius of Station 6 is characterized by commercial land use, primarily retail and office uses with some residential uses, and a major governmental job center within walking distance. The variety of land uses in this area result in high levels of daytime and evening activity.

The White Oak Shopping Center, a 28-acre shopping center with an anchor store, a major supermarket and a large parking lot, is located adjacent to the proposed

BRT station. The area south of Lockwood Drive across from White Oak Shopping Center includes an office building and a series of ancillary retail uses.

Townhomes and apartments make up the majority of housing stock in the half mile radius of the proposed BRT stop. Multi-family residential buildings are present on Lockwood Drive and Stewart Lane, and some single-family units west of New Hampshire Avenue are also within a half mile radius of the station.

The Food and Drug Administration (FDA) campus, with approximately 8,000 employees, is east of New Hampshire Avenue and south of Station 6. Dow Jones & Company has a printing plant located at the northeast edge of the half mile radius.

The commercial area east of New Hampshire Avenue and north of the FDA Campus, including White Oak Shopping Center is planned to be redeveloped as a mixed-use, walkable center. The development area is approximately 40 acres, and will include residential and commercial uses, as well as open spaces for the

communities. This will add foot traffic and increase the variety of travel destinations near Station 6. The White Oak Science Gateway Project is a long-term plan that will eventually result in rebuilding many of the areas east of Oak Leaf Drive to Stewart Lane, south of Columbia Pike.

Key Connections

Due to the status of this location as a transportation hub serving various types of land uses in the area, providing wider, ADA accessible and comfortable sidewalk connections are important. Sidewalk widths vary between 4 feet to 7 feet within the half-mile radius. The potential to widen some 4' sidewalk segments should be considered where feasible. Welcoming pedestrian environments will lead to the reduction of vehicle trips for those residents living in the half mile radius and encourage walking as a means to get to local destinations. Furthermore, a well-connected pedestrian network addresses the needs of commuters and those traveling by public transportation to Lockwood Drive. Safe crosswalks are critical to this connectivity; especially for those living west of New Hampshire Avenue and north of US 29.

Bicycle Access

The current very low stress bicycle route in this area is Lockwood Stewart Drive and other neighborhood streets. However, US 29 and New Hampshire Avenue are barriers that prevent very low stress access from these routes to local destinations.

Existing Facilities

- Bike lanes on Lockwood Drive

Planned Facilities

The Montgomery County Bicycle Master Plan recommends improvements for the White Oak area in order to provide connectivity for bicyclists along the US 29 corridor and parallel roads that would be lower stress routes for cyclists. Bicycle connectivity would help link the residential areas surrounding White Oak Shopping Center and the FDA campus with these destinations.

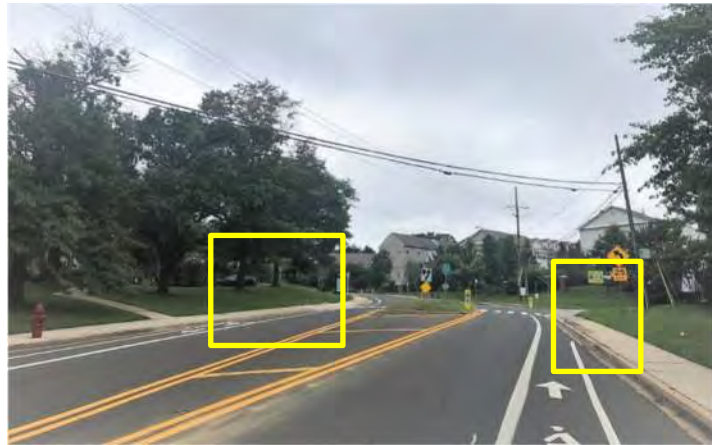
- Separated bikeway intersecting Lockwood Drive and US 29 on New Hampshire Avenue
- Separated bike lanes through White Oak Shopping Center continuing on Old Columbia Pike

Station 7 – Stewart Lane

Station 7 is located on Stewart Lane south of Columbia Pike between Lockwood Drive and April Lane. The proposed northbound bus stop is a near-side stop at April Lane and the southbound bus stop is a far-side bus stop at April Lane. Although there are no routes with stops at this location, existing Metrobus and Montgomery County Ride On bus stops are within 200 feet.



Planned BRT Station Locations



Planned BRT Station Locations (Looking northwest)

Development Patterns

The area within a half-mile radius of Station 7 is characterized by residential use, some commercial land use, both retail and office use, institutional use and is bordered by a major governmental job center to the south. The recommended BRT station location in this area would provide residents transit option as well as provide commute options for the office within a quarter mile of the proposed station location.

The residential community in the half-mile radius of the proposed BRT stop are mostly condominiums and townhomes. Single family residences are located northwest of Columbia Pike. A Montessori school is located across US 29 in the half-mile radius of the proposed location of Station 7. The White Oak Community Recreation Center is located within a quarter of a mile of Station 7.

The 28-acre White Oak Shopping Center, which features a department store, a major supermarket and a large parking lot, is located southwest of the proposed BRT station.

Dow Jones & Company has a printing plant located within a quarter mile of Station 7. The Food and Drug Administration (FDA) campus, with approximately 8,000 employees, is east of New Hampshire Avenue and at the southern edge of the half-mile radius of Station 7.

The commercial area east of New Hampshire Avenue and north of the FDA Campus, including White Oak Shopping Center is planned to be redeveloped as a mixed-use, walkable center. The development area is approximately 40 acres, and will include residential and commercial use, as well as open spaces for the communities. This will add foot traffic and increase the variety of travel destinations near Station 7. The White Oak Science Gateway Project is a long-term plan that will eventually result in rebuilding many of the areas east of Oak Leaf Drive to Stewart Lane, south of Columbia Pike.

Key Connections

Due to the residential nature of this location and nearby commercial use, accessible pedestrian connectivity is critical. Most of the area sidewalks are approximately five feet wide. These sidewalks should be wider for pedestrian safety. Welcoming pedestrian environments will lead to the reduction of vehicle trips for those

residents living in the area near Station 7 and encourage walking as a means to get to local destinations. Furthermore, a well-connected pedestrian network addresses the needs of commuters and those traveling by public transportation to Stewart Lane. Sidewalk connectivity within the neighborhood is also important. The neighborhood amenities such as the White Oak Community Recreation Center, would also benefit from the improved state of connectivity. Safe crosswalks are critical to this connectivity; especially for those crossing US 29 from the Spring Brook Manor neighborhood northwest of Columbia Pike.

Bicycle Access

The current very low stress bicycle route in this area is Lockwood Stewart Drive and other neighborhood streets. However, US 29 and New Hampshire Avenue are barriers that prevent very low stress access from these routes to local destinations.

Existing Facilities

- Bike lanes on Stewart Lane

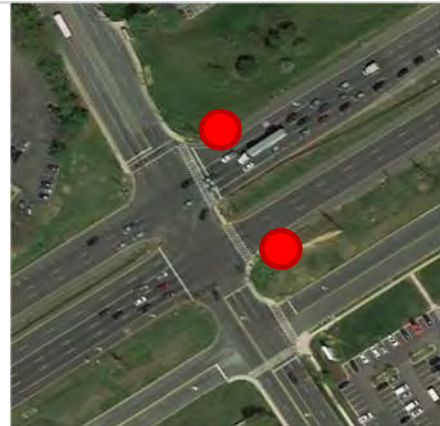
Planned Facilities

The Montgomery County Bicycle Master Plan recommends improvements for the White Oak area in order to provide connectivity for bicyclists along the US 29 corridor and parallel roads that would be lower stress routes for cyclists. Some initial bike lane markings have been painted on Stewart Lane and should be extended. Bicycle connectivity would help link the residential areas surrounding Station 7 with local destinations such as the White Oak Shopping Center and the FDA campus.

- Sidepaths on US 29 and on Lockwood Drive
- Neighborhood greenway/trails providing access from Sherbrooke Woods Lane and points west
- Trail connection from Lockwood Drive to Michelson Road and FDA Boulevard

Station 8 – Tech Road

Station 8 is located on Columbia Pike at the intersection of Tech Road. The proposed northbound location is at the far side of Tech Road and the proposed southbound location is at the near side of Tech Road. Although there are no routes with stops at this location, existing Metrobus and Montgomery County RideOn stops are within 300 feet on Tech Road and Old Columbia Pike. An existing park and ride lot is located northwest of the proposed southbound BRT Station.



Planned BRT Station Locations



Planned southbound BRT Station Location



Planned northbound BRT Station Location

Development Patterns

The area within a half mile radius of Station 8 is characterized by retail, industrial, residential and institutional land use. The variety of land use in this area result in high levels of daytime and evening activity on weekdays and weekends.

The Westech Corner shopping center on Tech Road consists of restaurants, a bank and two specialty stores. The shopping center is adjacent to the proposed northbound BRT station location. A hotel is also located by the shopping center. A storage facility is also located north of Westech Corner. Additional retail north of the shopping center include a home improvement retailer and a car dealership. The area south of Tech Road across from Westech Corner includes an office building and a bank at ground level. Two medical offices are also within quarter mile of the proposed BRT stations. Additional offices are located at the southern edge of the half mile radius of the proposed BRT stations.

The area south of Tech Road and north of Industrial Parkway, southeast of Columbia Pike is an industrial area with empty lots. A Montgomery County Public School bus depot is located in the southeast edge of the half mile radius.

The majority of residential land use is to the north and east of Columbia Pike. A mix of multi-family residential units and single-family dwelling units make up the residential land use. A religious organization's worldwide headquarters with (400 staff members) is located north of the proposed southbound Station 8. Other religious institutes are also located within the half mile radius of the proposed BRT stations.

The industrial area between Tech Road, Industrial Parkway and US 29 is slated for the White Oak Town Center, a proposed mixed use development. The development would include approximately 120 thousand

square feet of retail, 666 residential units, 76 unit hotel and a 56,000 square feet office building. The development would increase traffic to the area and would benefit from a BRT station located at its edge.

Key Connections

Due to the status of this location as an area with diverse land use, accessible pedestrian connectivity is critical. The area sidewalks are disconnected, narrow at approximately four feet wide and in poor condition. The sidewalk network should be connected and existing sidewalks should be wider. Welcoming pedestrian environments will lead to the reduction of vehicle trips for those residents living within the half mile radius and encourage walking as a means to get to local destinations. Furthermore, a well-connected pedestrian network addresses the needs of commuters and those traveling by public transportation to and from this area. As the existing bus stops and facilities indicate, this area has great potential for an added BRT station. The existing park and ride lot and numerous Ride On and Metrobus stations on Tech Road create a network of public transportation options. Due to the separation of many residential units northwest of Columbia Pike from the commercial and office use southeast of Columbia Pike, this area can improve in walkability by increasing safety at the intersections on US 29.

Bicycle Access

There are no very low stress bicycle routes in this area that provide access to the station area. Neighborhood streets on the west side of US 29 have low stress access to the Paint Branch Trail by the Randolph Road sidepath.

Planned Facilities

The Montgomery County Bicycle Master Plan recommends improvements for the White Oak area in order to provide connectivity for bicyclists along the US 29 corridor and parallel roads that would be lower stress routes for cyclists. Some initial bike lane markings have been painted on Old Columbia Pike north of Tech Road, however they should be improved and be extended. Bicycle connectivity would help link the residential areas surrounding Station 8 with local destinations and decrease vehicular use for practical distances.

- Sidepaths on both sides of US 29
- Separated bike lanes on Tech Road and Industrial Parkway, connecting through to FDA Boulevard
- Separated bike lanes on Broadburch Drive, connecting through to Cherry Hill Road
- Sidepath along Old Columbia Pike, extending north.

Future Traffic Forecasts and Traffic Operations

Population, Households, and Employment

In 2017 the Round 9.1 Cooperative Forecasts used in the COG travel model estimated the population in the study area to be 136,948. This is expected to grow by 19 % by 2040 to 163,006. According to 2010 decennial US Census data, nearly 62 percent of study area residents are minorities and five percent of the households in the study area are considered low-income and living below the poverty line.

The Round 9.1 estimates for the 2017 number of households at 53,115 and employment at 61,880 jobs in the BRT corridor. These are expected to grow to 64,893 households (21%), and 89,403 jobs (44 %) by 2040. The activity centers at White Oak and Silver Spring are expected to drive future growth in the study area. **Table 13** below summarizes the demographic changes.

Table 13. US 29 Corridor Land Use 2017-2040 by District

Study Area Subdistrict	2017			2040			Change 2017-2040 (Value)			Change 2017-2040 (Percent)		
	Houses	Pop.	Jobs	Houses	Pop.	Jobs	Houses	Pop.	Jobs	Houses	Pop.	Jobs
Inside I-495	23,346	55,556	28,445	29,207	68,018	34,062	5,861	12,462	5,618	25.1	22.4	19.8
I-495 to MD 200	15,043	42,624	21,176	20,170	54,051	42,686	5,127	11,427	21,509	34.1	26.8	101.6
MD 200 to MD 198	14,377	37,715	9,809	15,099	39,679	10,127	722	1,964	318	5.0	5.2	3.2
North of MD 198	349	1,053	2,450	417	1,258	2,528	68	205	78	19.6	19.4	3.2
Total	53,115	136,948	61,880	64,893	163,006	89,403	11,778	26,058	27,523	22.1	19.0	44.5

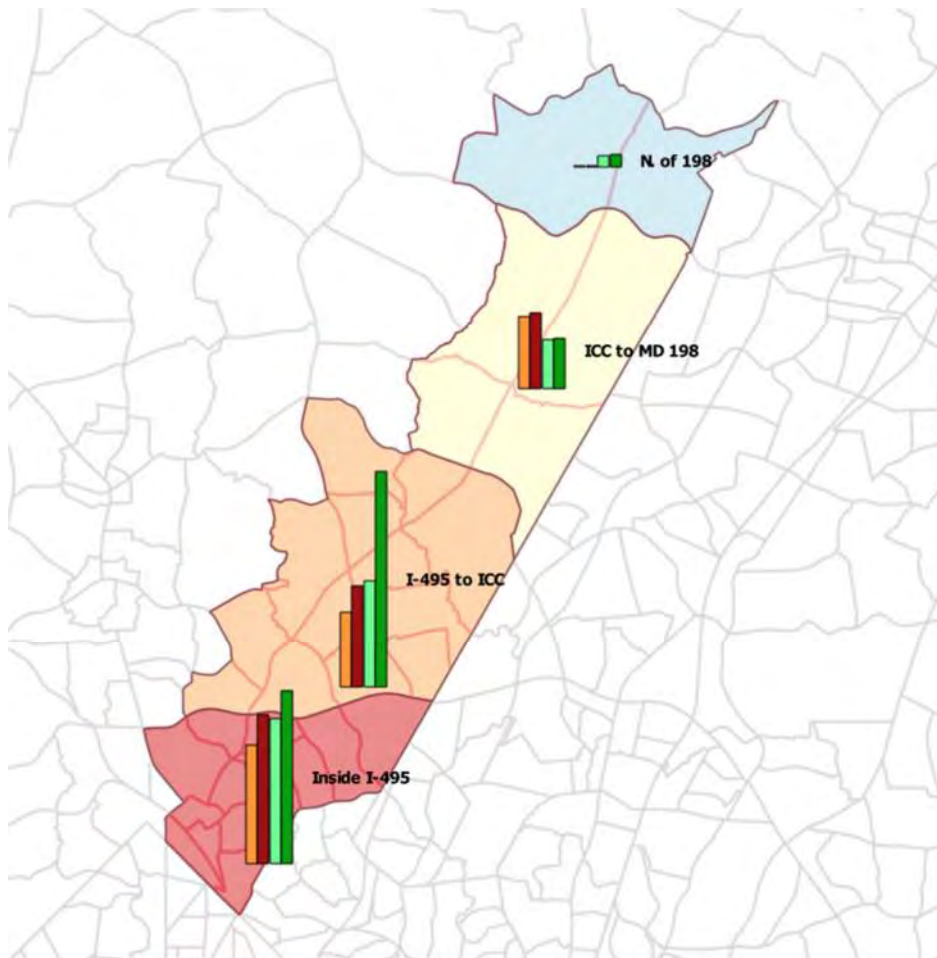


Figure 10 US 29 Corridor Land Use 2017 -2040 By District

As shown in **Figure 10**, population and employment in the corridor are both expected to grow between 2017 and 2040. The largest absolute increase in households (about 5,900) will take place south of I-495, and the largest absolute increase in employment (about 21,500) will take place between I-495 and MD 200. The largest relative increases in households (34%) and employment (102%) will take place between I-495 and MD 200. North of MD 200, relative and absolute household and employment growth is lower.

Activity centers at White Oak and Silver Spring are expected to drive future growth in the study area. As shown below in **Figure 11**, population and employment growth in those locations are much higher than in other parts of the corridor.

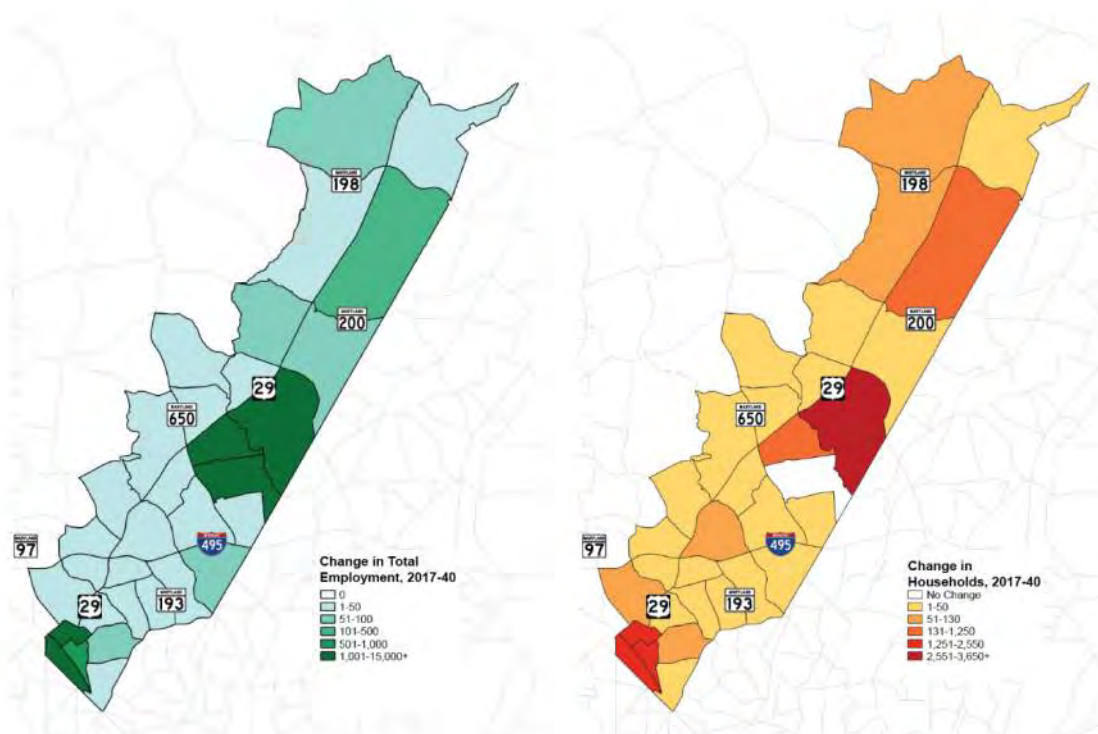


Figure 11. US 29 Subarea Change in Employment (left) and Households (right), 2017-40

Travel Forecasting Methodology

Travel Forecasting Model

The growth rates and traffic assignment patterns for input into the traffic analysis were developed using a subarea forecasting process based upon the MWCOC 2.3.70 Travel Demand Forecasting Model (TDFM) (the regional model adopted at the start of the study) with additional network and other inputs within the corridor from the MNCPPC Travel/4 Montgomery County travel forecasting model. The MWCOC 2.3.70 TDFM used the Round 9.0 Cooperative Forecasts for its land use (population, households, and employment) inputs which were updated with the Round 9.1 Cooperative Forecasts for Montgomery County along with other refinements from the MNCPPC Planning Department.

The MWCOC travel demand model is developed at the level of detail needed to support the regional constrained long-range plan and air quality analysis. Consequently, more detailed networks and Traffic Analysis Zones (TAZs) are often needed to capture the local traffic patterns and access locations for subarea/corridor studies and their operational analyses. This was found to be the case for the US 29 Mobility Study. The post mode choice assignment approach used was therefore developed to add the desired level of detail and mimic the previous MNCPPC Travel/3 model subarea process used for similar studies (such as the White Flint Sector Plan Update). This post mode choice assignment process has been

used successfully for recent analyses of the Germantown MARC Rail Area Sector Plan, and the MD 355 Phase II Montrose Parkway Extension Phase II Analysis.

The process included the following steps.

- Use as a foundation the 2017 and 2040 MWCOC 2.3.70 Travel forecasting Model networks and zone land use files. Update the land use within Montgomery County from the Round 9.0 to 9.1 Cooperative forecasts.
- Transfer 2017 and 2040 network detail, TAZ boundary splits within the US 29 Corridor "impact area" from the MNCPPC Travel/4 travel forecasting model. This included providing:
 - detailed "micro coding" for US 29 as a divided highway with accurate ramps
 - correcting the time of day lane changes for US 29 inside the beltway
 - coding the future BRT network routes and stop assumptions and removal of proposed interchanges at Tech Road, Musgrove Rd, and Fairland Pkwy.
- Check the network and other assumptions within the corridor for accurate number of lanes, time of day characteristics, distances, speeds, and functional classes.
- Conduct new base runs (2017, 2025, and 2040) of the regional model.
- Add additional network and TAZ detail for the study area including turn restrictions by time of day.
- Prepare a new detailed subarea forecast using post mode choice assignment and carry out reasonableness checks. This included:
 - Disaggregate the land use data (population, households, employment) from each MWCOC parent TAZ to its Subarea Study child TAZs
 - Take the updated base regional model person trip tables output from the mode choice model (by purpose and mode) and disaggregate them based upon the subarea TAZ land use and MWCOC trip production and attraction formulas.
 - Carry out the subarea post mode choice assignment using the detailed subarea network and TAZs (this also includes the auto driver and time of day steps in the MWCOC Model).
 - Carry out reasonableness checks on the results to the 2017 24-hour traffic counts and update assignment parameters including facility types and link specific free flow speeds and capacities and turn restrictions.
- Prepare the horizon year (2025, 2040) subarea detailed base forecasts:
 - Transfer the network assignment validation parameters to the 2025 and 2040 networks.
 - Create the 2025, 2040 subarea land use data file (zone.dbf) based future development plans, and inputs from MNCPPC, the county and other sources.
 - Incorporate the latest White Oak Master Plan and developer updates in the assumptions.
 - Take the MWCOC 2.3.57a person trip tables output from the mode choice model and disaggregate/expand them based upon the subarea TAZ land use and the MWCOC trip production and attraction formulas.
 - Carry out the subarea post mode choice assignment using the detailed subarea network and TAZs (this also includes the auto driver and time of day steps in the MWCOC Model).
- Prepare the link and turning movement growth factors used for the peak hour operational analyses.

This process is shown in **Figure 12**.

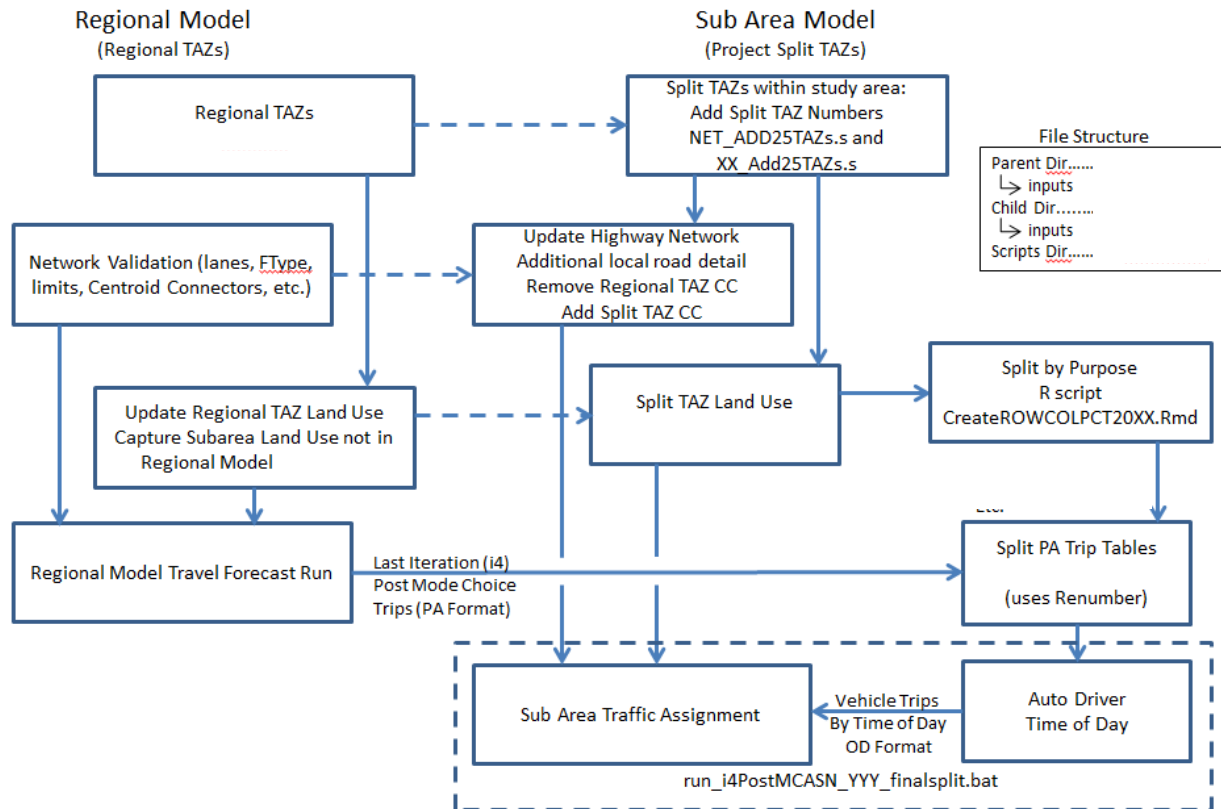


Figure 12 Subarea Assignment Process (MWCOC Base Model)

Post Processing

The model outputs daily vehicle trips (ADT) and traffic assignments for the study area. The Transportation Research Board's National Cooperative Highway Research Plan 255/765 post-processing methods were developed and applied to refine the model outputs for existing and projected traffic volumes and develop future year local traffic/intersection level data for the study intersections. This process developed a balanced 2025 and 2040 volume set of intersection level traffic counts, which are included in **Appendix I**.

2025 No Action Analysis

2025 No Action Scenario

Under the No Action scenarios, there are no changes from existing conditions in the study area except for the installation of a new traffic signal at the intersection of US 29 at Lanark Way.

Traffic Analysis Methodology

Intersection capacity analysis was performed at each study intersection under the 2025 No Action scenario. Future 2025 turning movement volumes were coded into a Synchro network to perform capacity analysis using the same methodology described in the Existing Conditions section. The results summarize operations of each study intersection using the same key measures of effectiveness. The turning movement volumes were also updated in the VISSIM models.

2025 No Action Results

Roadway Conditions and Traffic Operations

Arterial and intersection levels of service for the AM and PM Peak hours are shown in **Figure 13** below for vehicles and **Figure 14** for the BRT. Intersections which show a failing level of service (LOS E or LOS F) during at least one peak based on HCM methodology are shown **Table 14**, and segments which show a failing level of service during at least one peak are shown in **Table 15**.

Table 14: 2025 No Action Failing Intersections

Intersection	LOS	
	AM	PM
US 29 & Blackburn Rd	E	-
US 29 & Greencastle Rd	F	F
US 29 & Fairland Rd	E	-
US 29 & Musgrove Road	-	-
US 29 & Tech Rd	F	F
US 29 & Industrial Parkway	-	-
US 29 & Milestone Drive/Stewart Lane	-	E
US 29 & Prelude Drive	-	-
US 29 & Burnt Mills Avenue	-	-
US 29 & Lockwood Drive	-	-
US 29 & Burnt Mills Shopping Ctr	E	F
US 29 & Southwood Ave	F	-
US 29 & MD 193 Eastbound	-	-
US 29 & MD 193 Eastbound	E	-
US 29 & Lanark Way	E	-
US 29 & Hastings Way	-	-
US 29 & Franklin Ave	-	F
US 29 & Sligo Creek Parkway & St. Andrews Way	F	F
US 29 & MD 391 (Dale Dr)	F	F
US 29 & Spring St	F	F
US 29 & Fenton St	-	E
US 29 & Georgia Avenue	-	-
Colesville Rd & 2nd Ave/Wayne Ave	E	-

US 29 Mobility & Reliability Study Technical Report

In addition to 15 failing intersections (eight more than existing conditions), 21 segments (4 more than existing conditions) also experience failing link level of service in at least one peak hour. Some of the failing links are due to intersection operations while others are due to congestion at ramp/merge areas with intersecting corridors. The link levels of service are based on percent of base free-flow speed and were calculated from the speeds output from the VISSIM model. The segments in **Table 15** below operate at LOS E or F in at least one direction in at least one peak hour:

Table 15: 2025 No Action Failing Segments

		LOS			
US 29 Segment Limits		AM		PM	
North	South	SB	NB	SB	NB
Blackburn Rd	Greencastle Rd	E	-	-	-
Greencastle Rd	Fairland Rd	-	-	-	F
Fairland Rd	Musgrove Rd	F	-	-	-
Musgrove Rd	Tech Rd	F	-	-	-
Tech Rd	Industrial Pkwy	F	F	-	F
Industrial Pkwy	Stewart Ln Slip Ramp	F	-	-	-
Stewart Ln Slip Ramp	Stewart Ln	F	-	-	-
Stewart Ln	Prelude Dr	F	-	-	-
Prelude Dr	Burnt Mills Ave	F	-	-	-
Burnt Mills Ave	Lockwood Dr	F	-	-	-
Lockwood Dr	Burnt Mills SC	F	-	-	-
Burnt Mills SC	Southwood Ave	F	-	E	F
Southwood Ave	MD 193 WB	F	-	F	F
MD 193 WB	MD 193 EB	-	-	F	F
MD 193 EB	Lanark Way	E	-	F	F
Lanark Way	N. 495 Interchange	E	E	F	E
Franklin Ave	Sligo Creek Pkwy	E	-	F	-
Sligo Creek Pkwy	Dale Dr	-	F	F	F
Dale Dr	Spring St	-	E	-	F
Spring St	Fenton St	-	F	F	F
Fenton St	Georgia Ave	-	E	E	-

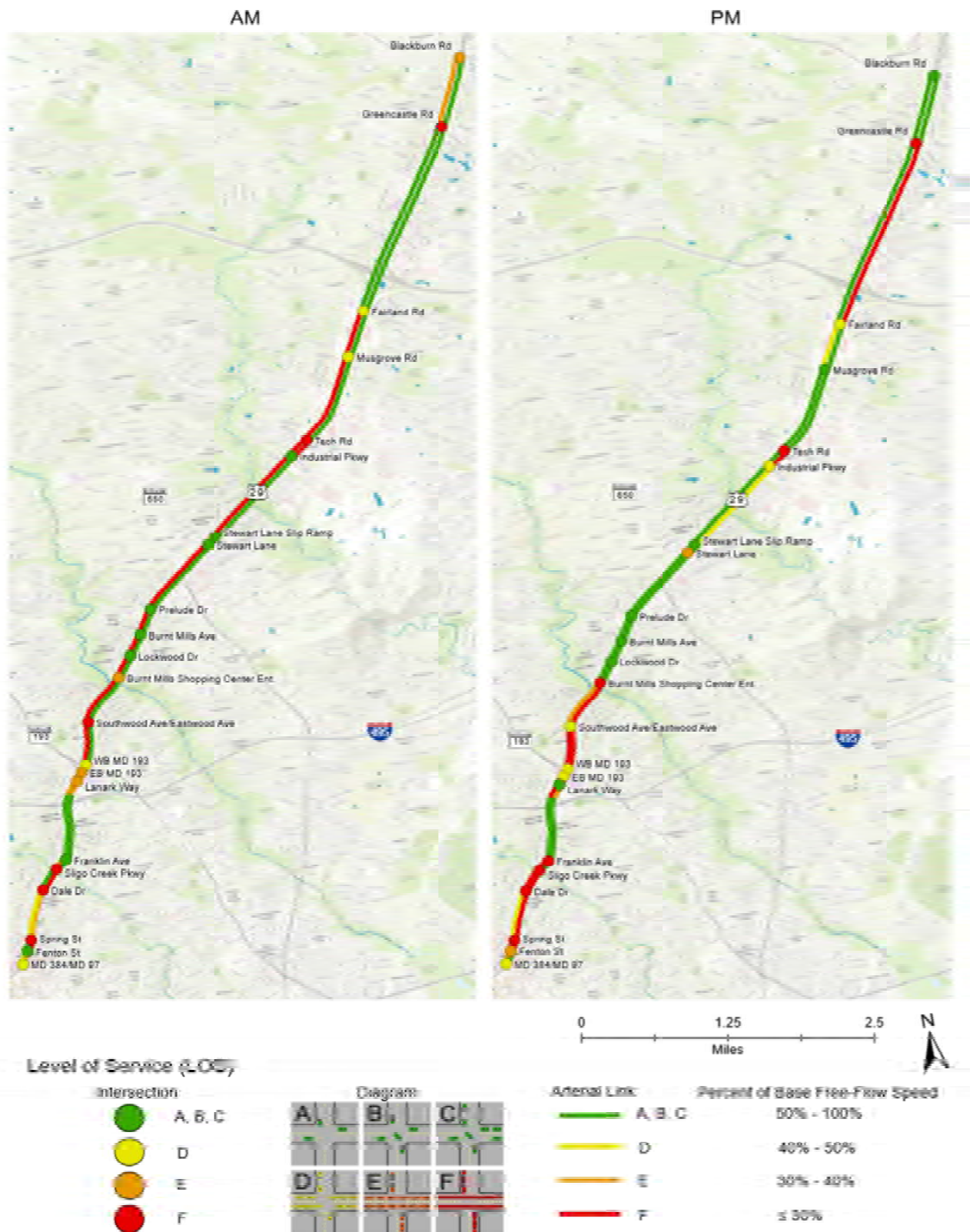


Figure 13: 2025 No Action Link and Intersection Level of Service - Vehicles

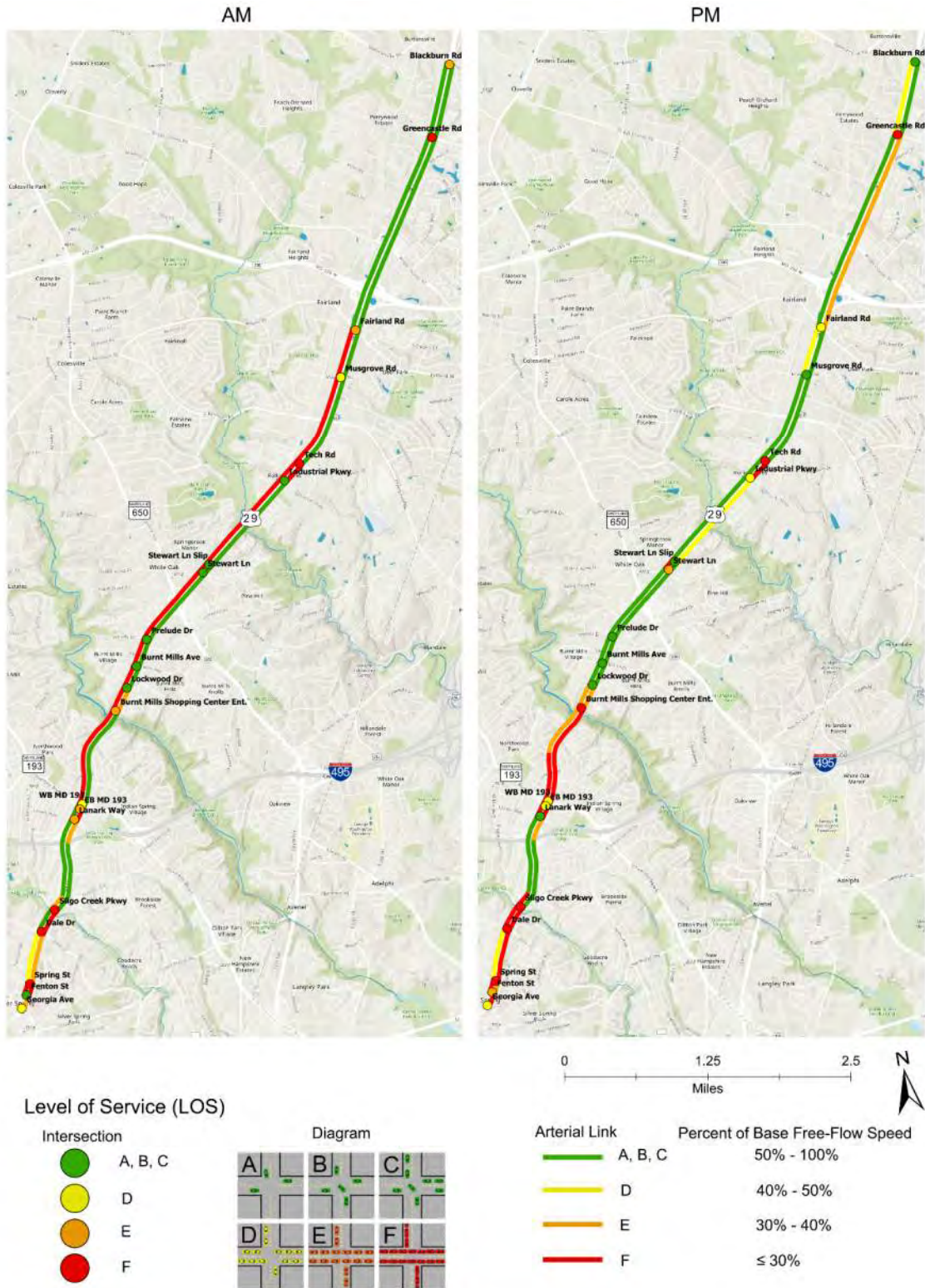


Figure 14: 2025 No Action Link and Intersection Level of Service - BRT

Travel Times

Travel times for 2025 No Action passenger vehicles and buses by peak period and travel direction are shown in **Figure 15** below. Without any improvements, travel times in the southbound AM are expected to nearly double for passenger vehicles; and increase by 10 minutes for peak hour peak direction buses in comparison to existing conditions.

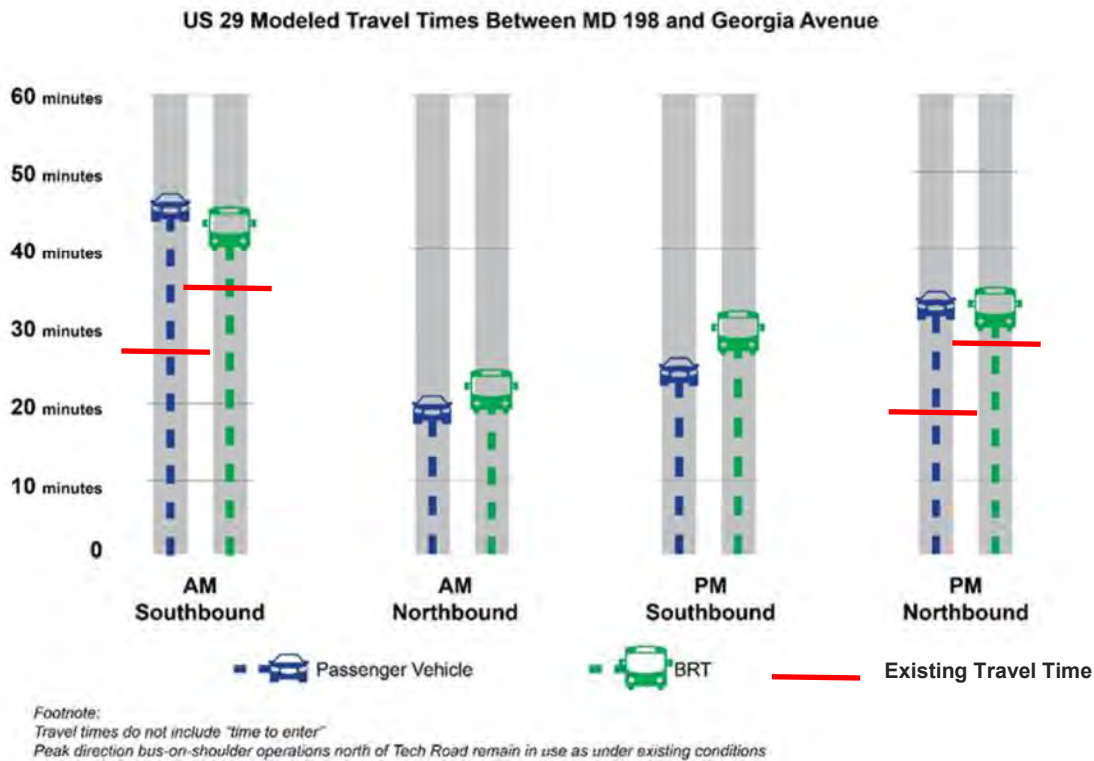


Figure 15: 2025 No-Action Modeled Travel Times Between MD 198 and Georgia Avenue

Alternatives Development and Evaluation

Building on previous studies and stakeholder input, a menu of improvement types was identified to address the project's goals. These improvement types included:

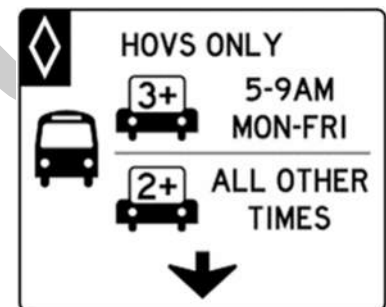
- **Targeted Intersection Improvements** to address roadway capacity needs and reduce bottlenecks
- **Robust Pedestrian and Bicycle** facility upgrades and new connections for station accessibility for walking and biking
- **Transportation Demand Management / Traffic Technology and Traveler Information** measures to reduce non-recurring congestion and encourage carpooling
- **Corridor-Level Design and Operational Treatments for Bus Priority**

Specifically, for the corridor level bus priority alternatives, the following options were evaluated based on concepts provided by the US 29 Bus Rapid Transit Corridor Advisory Committee:

- **Dedicated Median Bus Lane:** Buses would run at all times in an exclusive guideway within a physically separated right-of-way in the median of US 29. In some segments the median busway would provide two lanes, and others just a single reversible lane that would be used in the peak direction only. This option runs from MD 650 to Sligo Creek Parkway
- **Rush Hour Managed Bus/ HOV Lanes** – Buses would run in the left-travel lane during rush hour in the peak direction only along with carpool vehicles (2 or more persons). This option would run from Musgrove Road to Southwood Avenue and within the reversible lane from Sligo Creek Parkway to Spring Street. A subset of this option includes the peak hour use of existing shoulders for general traffic or bus/ HOV to provide additional capacity.
- **Full-time Bus on Shoulder** – Buses would run in the left or right shoulder north of Musgrove Road to the Burtonsville Park and Ride to bypass traffic congestion and queues.

WHAT IS A MANAGED LANE?

Managed Lanes restrict access to certain vehicle types such as High Occupancy Vehicles (HOVs) and buses or operate in unique configurations during certain times of day, such as rush hour shoulder use or a reversible lane



US 29 Mobility & Reliability Study Technical Report

For intersection and interchange improvements, multiple geometric and traffic operational options were identified and screened based on cost, environmental impact, right-of-way impact, expected safety benefit, expected operational benefits, expected community support (e.g. traffic impacts to adjacent neighborhood), and degree of permitting required. A screening matrix is shown below in **Figure 16**. The options with the best propensity were included and evaluated in combination with the preferred corridor-wide alternative.

No.	Location	Improvement	Env.	Cost	ROW	Safety	Comm. Support	Operational Benefit	SHA/FHWA Permitting
1a	Greencastle Rd	Add Eastbound right turn lane	Low	\$\$	Low	Little change	Likely	More time for mainline	None
1b	Greencastle Rd	Second southbound left-turn lane	Low	\$\$	Low	Improves	Likely	More time for mainline	SHA Roadway
1c	Greencastle Rd	Remove WBL Phase	None	\$	None	Decrease	Unlikely	More time for mainline	SHA Signal
2	Musgrove Rd to MD 650	Hard running shoulder	None	\$\$\$	None	Decrease	Unknown	Additional through lane	SHA Roadway
3a	Tech Rd	Add Westbound right run lane	Low	\$\$	Low	Little change	Likely	More time for mainline	None
3b	Tech Rd	Removal of Split Phasing/Side Street Lane Configs	None	\$	None	Decrease	Unknown	More time for mainline	SHA Signal
4	Industrial Parkway to Paint Branch	Widening for hard running shoulder	High (branch)	\$\$	Low	Decrease	Unknown	Additional through lane	SHA Roadway
5	MD 650	Widening for additional through lane	Low	\$\$	High	Little change	Unknown	Additional through lane	SHA Roadway
6	Lockwood Drive BRT Station	Median BRT Station w/ signal(widening, road closure)	Low	\$\$	High (gas station)	Little change	Unlikely (road closure)	More time for mainline (ped clearance moved)	SHA Roadway
7	Southwood Ave	Remove NBL Phase (AM)	None	\$	None	Decrease	Unlikely	More time for mainline	SHA Signal
8	MD 193 BRT Station	BRT Station New Signal	Low	\$\$	Low	Little change	Likely	New Signal on US 29	SHA Roadway
9a	I-495 Option 1	Hard Running Shoulder on I-495	None	\$\$\$	None	Decrease	Likely	Additional Lane I-495	FHWA (IAPA)
9b	I-495 Option 2	Dynamic Lane Control	None	\$\$	None	Unknown	Unknown	I-495 MD 193	FHWA (IAPA)
10a	Sligo Creek Parkway	Closure of 5 th Leg	None	\$	None	Little change	Unlikely	More time for mainline	None
10b	Sligo Creek Parkway	Side Street Widening	High	\$\$	Low	Improves	Unknown	Side Street Only	Park land
11a	Dale Drive	Left-turn Restrictions	None	\$	None	Improves	Unlikely	High	SHA Roadway
11b	Dale Drive	Remove Side-street Protected lefts phase	None	\$	None	Decrease	Unlikely	More time for mainline	SHA Roadway
12	Spring Street	Remove Split Phasing	None	\$	None	Decrease	Unlikely	More time for mainline	SHA Roadway

Figure 16: Intersection Improvement Screening Matrix

Grade separation / Interchange Construction alternative – The study considered as a long-term option at the intersections of US 29 and Blackburn Road, Greencastle Road, Fairland Road, Musgrove Road, Tech Road, Industrial Road and Stewart Lane the removal of existing traffic signals and constructing new grade separated interchanges. However, preliminary modeling results indicated that interchange construction was found to negatively impact corridor travel times for all modes and thus was not retained for the final mobility package. The removal of the existing signals in the northern end of the corridor allows more vehicles to enter the study corridor and moves the bottleneck downstream to the segment between MD 650 and I-495. This creates a longer inbound AM rolling queue from I-495 north to Cherry Hill/Randolph and beyond. Travel time savings from constructing the interchanges are therefore offset by additional delays and queues extending from intersections south of MD 650. Therefore, vehicles experienced little to no change in overall travel times from 2040 No-Action conditions.



Figure 17: Previous study interchange design concept for US 29/ Greencastle Road

Based on the qualitative screening and traffic operations analysis of individual intersection improvements the following intersection improvements were selected:

- US 29 at Greencastle Road
 - Add Eastbound Right-turn Lane
 - Add Second Southbound Left-turn Lane and Eastbound Receiving Lane
- US 29 at Tech Road
 - Add 2nd Southbound Left-turn Lane on US 29
 - Westbound Approach Widened to Provide Additional Right-turn Lane (Westbound lane configuration assumed to be Left, Left/Through, Through/Right, Right)
 - Eastbound approach reconfigured to Left, Through, Through/Right
- US 29 at Stewart Lane
 - Add a 2nd Southbound left-turn lane on US 29
- US 29 at MD 650
 - Widening of US 29 within the MD 650 interchange to provide 3 continuous southbound through lanes
- US 29 at I-495
 - Designate a 2nd 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 (additional ¼ to ½ mile), 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 (1 mile)
- US 29 at Sligo Creek Parkway
 - Side Street Lane Modifications
 - Provide an auxiliary through lane westbound, will reduce delays on the side street and increase capacity.

Concept plans and construction costs are shown in **Figure 18**.

Figure 18. Intersection / Interchange Improvement Concepts and Costs



Greencastle Road

- Add Eastbound Right-Turn Lane
- Add Second Southbound Left-Turn Lane and Eastbound Receiving Lane

\$4-5M Construction



Stewart Lane

- Add a 2nd SB left turn lane on US 29 at Stewart Lane

\$2-3M Construction

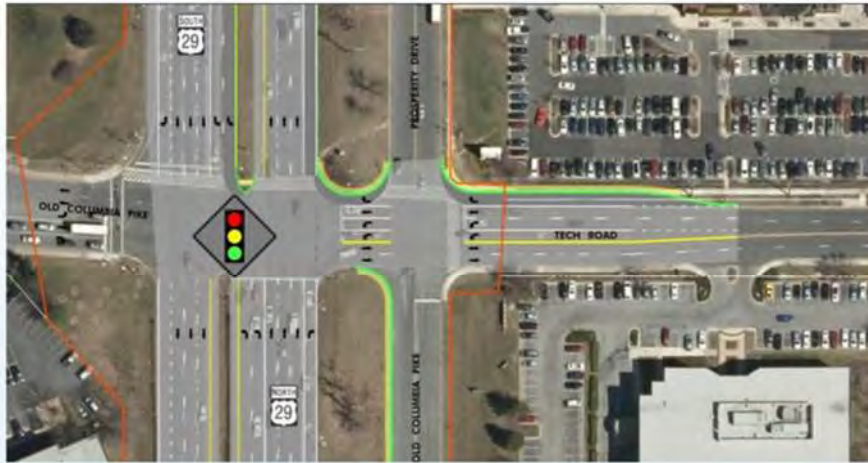


I-495 Westbound

- 2nd exit lane from SB US 29 to WB I-495

\$2-3M Construction

Figure 18 (Continued). Intersection / Interchange Improvement Concepts and Costs



Tech Road

- Additional US 29 turn lanes (2nd SBL) and side street widening for additional westbound right-turn lane at Tech Road

\$2-3M Construction



MD 650

- 3rd Southbound US 29 lane addition through MD 650

\$6-7M Construction

- » Potential Additional Intersection / Ramp Configuration Revisions



Sligo Creek

- Sligo Creek Parkway enhancement at US 29 for 2nd westbound through lane

\$3-4M Construction

Pedestrian and Bicycle Improvements

To support enhanced station access along the corridor and connectivity to adjacent neighborhoods, potential pedestrian and bicycle improvements were identified to provide a contiguous non-motorized network. The September 2017 Bicycle and Pedestrian Workshop Comments were reviewed for feasibility, as well as other relevant Master/ Sector Plan documents (e.g. White Oak, County Bikeway Master Plan). Any adverse impacts to existing pedestrian and bicycle facilities/accessibility due to other proposed roadway improvements were noted and mitigation identified and developed if needed. Station barriers and recommendations maps were created for all eight stations. Over 200 individual walking and biking recommendations including:

- New and reconstructed sidewalks – 19.0 miles
- Shared use paths – 13.8 Miles
- Off-Street Trails – 2.2 Miles
- Separated on-road bike lanes – 15.8 miles
- Shared roadway on-road bike lanes – 5.4 miles
- Bicycle/ pedestrian bridges – 5 structures
- ADA compliance updates
- US 29 pedestrian crossing improvements
- Bicycle parking

Full station area mapping illustrating multi-modal recommendations/ expanded walking and bicycle sheds and a summary listing of pedestrian and bicycle recommendations by project are included in **Appendix III**.

The estimated construction cost for all pedestrian and bicycle improvements is approximately \$15-20M (excluding side paths and bridges)

Transportation Systems Management and Operations/ Transportation Demand Management

Transportation Systems Management and Operations (TSMO) is a cross-cutting approach defined by the US DOT Federal Highway Administration as “a set of strategies that focus on operational improvements that can maintain and even restore the performance of the existing transportation system before extra capacity is needed”. This is accomplished through better integration, coordination, and systematic implementation of key operational strategies. Such strategies may include traveler information, active traffic management such as ramp metering, dynamic lane usage, dynamic pavement markings, performance-based curb usage/ pricing, variable speed limits, and smart traffic signals, traffic incident management and others to deliver performance-driven improvements to the existing system. **Figure 19** below illustrates a broad range of TSMO strategies.

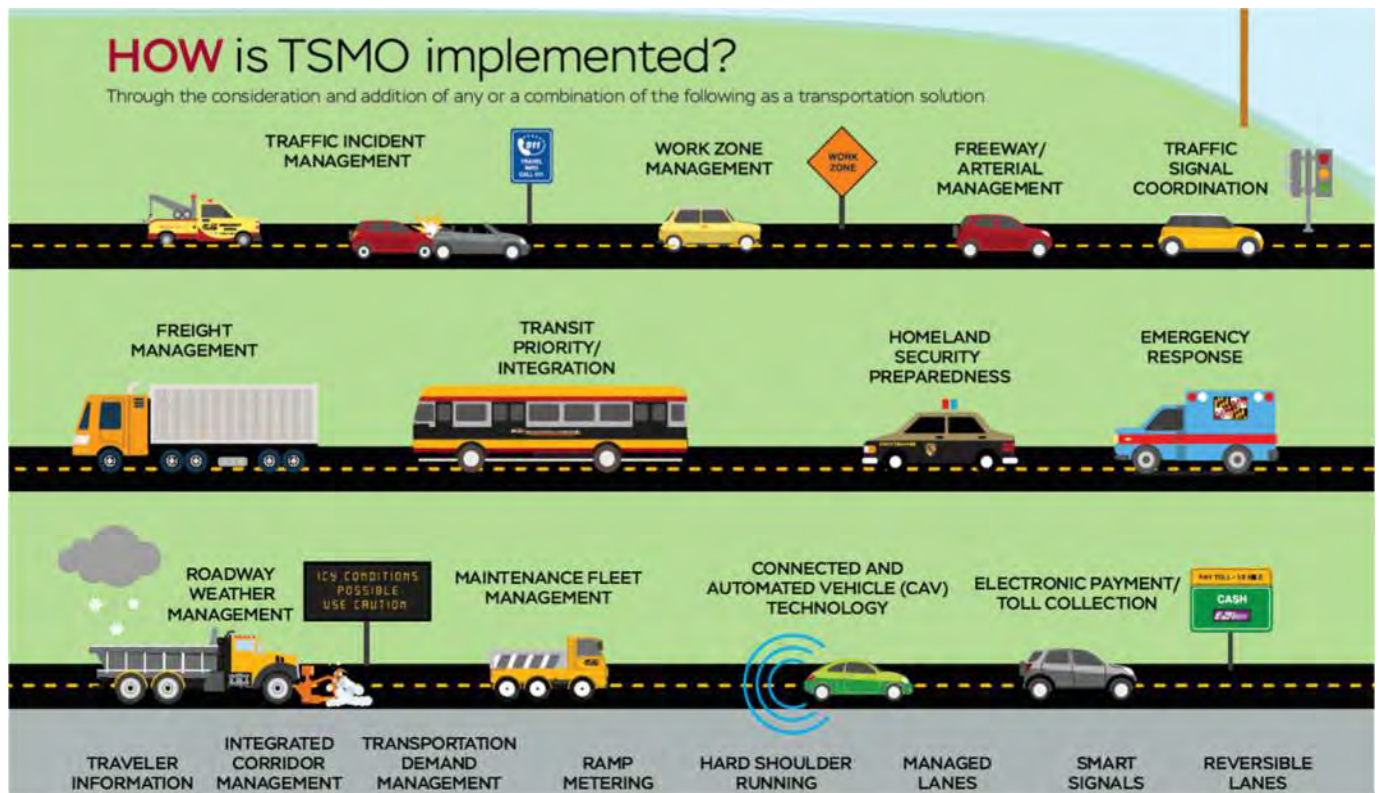


Figure 19 Transportation Systems Management and Operations Strategies

Specific strategies recommended for the US 29 corridor include the following

- Provide real-time travel time information from the County line to I-495 and Silver Spring: Traveler information can be disseminated through a variety of media including variable message boards, radio, internet, telephone, and in-vehicle or handheld navigation systems. Travelers who are informed about weather and driving conditions, delays and detours, parking and other situations that may affect their travel can use the information to make decisions and increase the mobility, safety, and satisfaction of their trip.



- Implement commuter incentive programs to encourage carpool, bus and bicycle use: creating and enhancing marketing and programming to connect commuters to alternative modes of travel in the corridor, carpool formation as well as innovative programs such as incentrip (<https://www.commuterconnections.org/incentrip-app/>) which reward commuters for choosing alternative commuting modes and time. By having more people using one vehicle, carpooling reduces each person's travel costs and results in less demand for roadway space.
- Develop an Integrated Corridor Management Plan for US 29, I-95, US 1 and the Baltimore Washington Parkway/ MD 295: Integrated corridor management (ICM) is an approach designed to actively monitor for atypical recurring and nonrecurring events on multiple parallel arterials or freeways within a corridor. Because of recurring congestion, even minor events on a single facility can have a huge impact on parallel facilities. ICM requires the institutional, operational, and technical integration of State and local agencies to combine their assets into one unified real-time response.
- Increase incident response patrols: Expanding service patrol coverage US 29 will help reduce incident response times and non-recurring congestion due to crashes and vehicle breakdowns.
- Implement smart signal timing technology for demand-responsive timing plans: the deployment of new traffic signal timing technology will enable traffic signal timing to automatically adjust to unexpected traffic conditions, dynamically change timing based on real-time vehicle demand including cycle lengths, green intervals and coordination between signals
- Providing real-time commuter park and ride space availability – implementing signs with real-time park and ride lot space availability can be an easy tool to ensure that FLASH patrons do not spend unnecessary time searching for a parking space and missing a connection.



The estimated costs for these Transportation System Management and Operations strategies is \$5 million per year

Corridor-Level Concept Geometric Design Elements, Impacts and Cost Evaluation

Concept-level geometric designs were developed after reviewing proposed dimensioned typical roadway sections, roadway capacity improvements and bus priority treatments. CADD design plans were created using existing aerial imagery, GIS layers and contours and as-built drawings. Proposed geometric improvements at intersections, interchanges and for bus priority were evaluated for compatibility with County, Maryland DOT and Federal Highway design standards, major quantities estimated for construction costs, and potential impacts tabulated for right-of-way, utilities, environmental and constructability. CADD roll plans for each design are included in **Appendix IV**, construction cost estimates are included in **Appendix V** and impacts are summarized in **Appendix VI**.

Notable assumptions in developing cost estimates for roadway and bus priority improvements are as follows:

- **Utilities:** At the concept level, existing above ground/overhead utilities were identified and impacts to them minimized where widening is proposed, but the location of the existing underground utilities is mostly unknown at this stage of the project. Therefore, per the recommendation of the SHA Cost Estimating Manual, 15% of the construction costs were estimated for utility relocations
- **Right-of-Way:** For the purposes of the concept design, existing right-of-way limits were established using GIS information. For conceptual impacts to existing right-of-way, all acquisitions were assumed to be total takes (no proposed easements) offset approximately 5' from the outer limits of the proposed sidewalk, curb and gutter, retaining wall or roadway widening. The cost of right-of-way was assumed to be \$1M per acre based on recent property sales in corridor appearing on Zillow.
- **Environmental:** Impacts to the 100 year floodplain associated with Sligo Creek, Northwest Branch Anacostia River, and Paint Branch are anticipated with this project. Impacts to wetlands, wetland buffers, and waters of the US may also be anticipated. However, only GIS information is available for the floodplains and the other environmentally sensitive areas have not yet been delineated within the corridor. Therefore, an estimated extent of these impacts is unknown and environmental cost have not been included. Ultimately, any impacts to these environmentally sensitive areas is anticipated to required a Joint Permit Application (JPA) and may also require mitigation. Impacts to trees are anticipated to require a Roadside Tree Permit and may require plantings. The roadway widening proposed is anticipated to increase the impervious area and require stormwater management design to obtain SHA Plan Review Division (PRD) approval. Estimate quantities for excavation and right-of-way required for stormwater management have been included in the cost estimates per the recommendations provided in the SHA Cost Estimating Manual.
- **Structures:** Per the SHA Cost Estimating manual, square foot costs were used to estimate new bridge construction, bridge deck replacement, and retaining wall costs within the corridor. The heights of retaining walls were approximated using GIS contour data to conservatively estimate the average height of a wall along its proposed length.
- **Pedestrian side paths and bridges:** Roadway costs for median bus and managed lane alternatives do not included new side paths and pedestrian bridges, assumed to be implemented as a separate project

2025 Median Bus Lane Corridor Alternative Evaluation

2025 Median Bus Lane Scenario

The median bus lane concept (also known as the Emerson Smoot concept) has a dedicated median bus lane from Sligo Creek Parkway to Tech Road, with stops at Tech Road Station at Tech Road, Burnt Mills Station south of Burnt Mills Avenue, and Four Corners Station at University Boulevard. There will be a dual busway near the stations, from north of Stewart Lane, Southwest Drive to Burnt Mills Shopping Center, and from Timberwood Avenue to Granville Drive. Where there is not a dual busway, there will be a bidirectional busway.

Under the Median Bus Lane scenario, there are multiple 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), new turn restrictions, and new crosswalks as shown in **Figure**

20. In addition, the cross-section of the roadway will change as shown in **Figure 21**. Key geometric design features include:

Lane Width Reductions:

The concept depends upon the reduction of lane widths from 11-12' to 10' in the inner lanes (non-curb lanes) and 12' to 11' in the curb lanes. In the 84' sections, this will result in two 31' carriageways and 20-22' of median space, in contrast to the current configuration of two 34' carriageways and a 16' median.

Reduction from eight to six lanes from I-495 to Timberwood Avenue

Through the Four Corners area, the concept proposes removing the existing left travel lanes on US 29 from Timberwood Avenue to the area of south of Lanark Way. The new configuration in this area will consist of two 31' roadways (northbound and southbound) and a 42' median space containing the two-lane busway and median stations.

Geometric Design Elements, Impacts and Costs

The preliminary engineering design of the Median Bus Lane alternative has proposed geometric design waivers, evaluated right-of-way impacts, ADA upgrades, bicycle compatibility, stormwater management and environmental impacts/ permitting, utility impacts/ relocations, structure / retaining wall needs, new traffic signal and estimated construction costs.

The total estimated construction cost for the full implementation of the Median Bus Lane alternative would be \$106 million. The following additional impacts were noted.

- Design waivers: Reduced Lane Width / Bike Waiver south of MD 650
- Right-of-Way required: 9.8 Acres
- Utilities impacted: Various Underground and Overhead Utility Relocation in areas of Widening/Full Depth Reconstruction (Approximately \$8.3M)
- Environmental impacts/ permitting: Impacts to Paint Branch & Northwest Branch for New Bridge Construction / Stormwater management/ Roadside Tree Permit

Traffic Analysis Methodology

Intersection capacity analysis was performed at each study intersection under the 2025 Median Bus Lane scenario. Future 2025 turning movement volumes were coded into a Synchro network to perform capacity analysis using the same methodology described in the Existing Conditions section. The results summarize operations of each study intersection using the same key measures of effectiveness. The turning movement volumes were also updated in the VISSIM models.

2025 Median Bus Lane Results

Roadway Conditions and Traffic Operations

Arterial and intersection levels of service for the AM and PM Peak hours are shown in **Figure 22** below for vehicles and **Figure 23** for the BRT. Intersections which show a failing level of service (LOS E or LOS F) during at least one peak based on HCM methodology are shown **Table 16**.

In addition to failing intersections, several segments also experience failing link level of service as shown in **Table 17**. Some of the failing links are due to intersection operations while others are due to congestion

at ramp/merge areas with intersecting corridors. The link levels of service are based on percent of base free-flow speed were calculated from the VISSIM model outputs.

Operational challenges with median bus lanes

The results of the traffic modeling and simulation of the median bus lane indicate several factors influencing the increased travel time for vehicle traffic and transit buses. The installation of multiple new traffic signals result in increased signal delay along the corridor. The reduction in roadway capacity through Four Corners with the elimination of the 4th travel lane reduces vehicle throughput and queue storage, which results in northbound congestion from Four Corners spilling back into downtown Silver Spring during PM peak period and southbound congestion from the I-495 interchange north to Cherry Hill/Randolph and beyond in the AM peak period. This additional congestion decreases bus speed and increases bus travel time in the mixed traffic segments prior to entering the median bus lane. That lost time cannot be recovered within the dedicated lane segment, thus no significant benefits to the buses are realized.

Draft

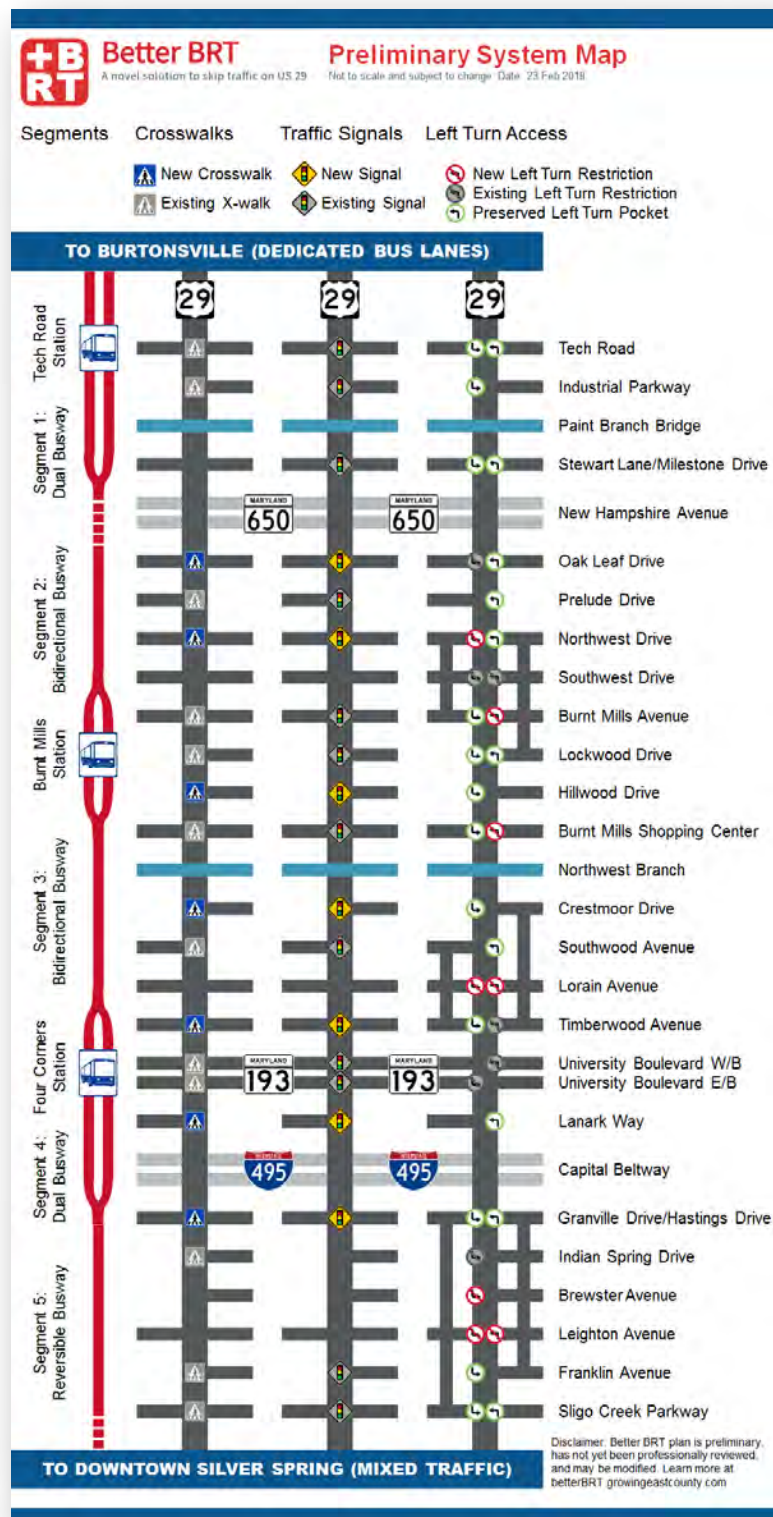
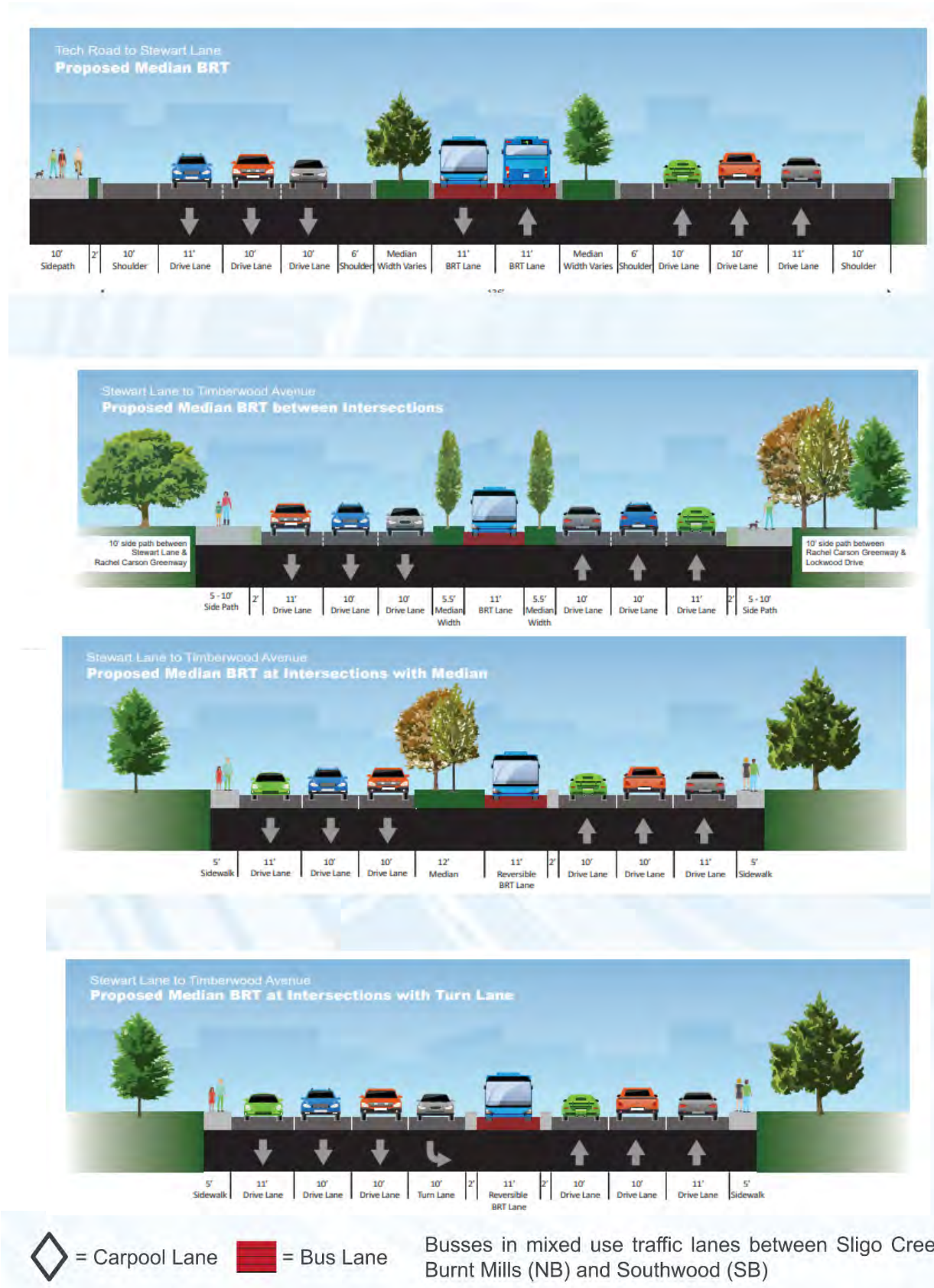


Figure 20: Median Bus Lane Concept (source: Better BRT)

Figure 21: Median Bus Lane Typical Sections



US 29 Mobility & Reliability Study Technical Report

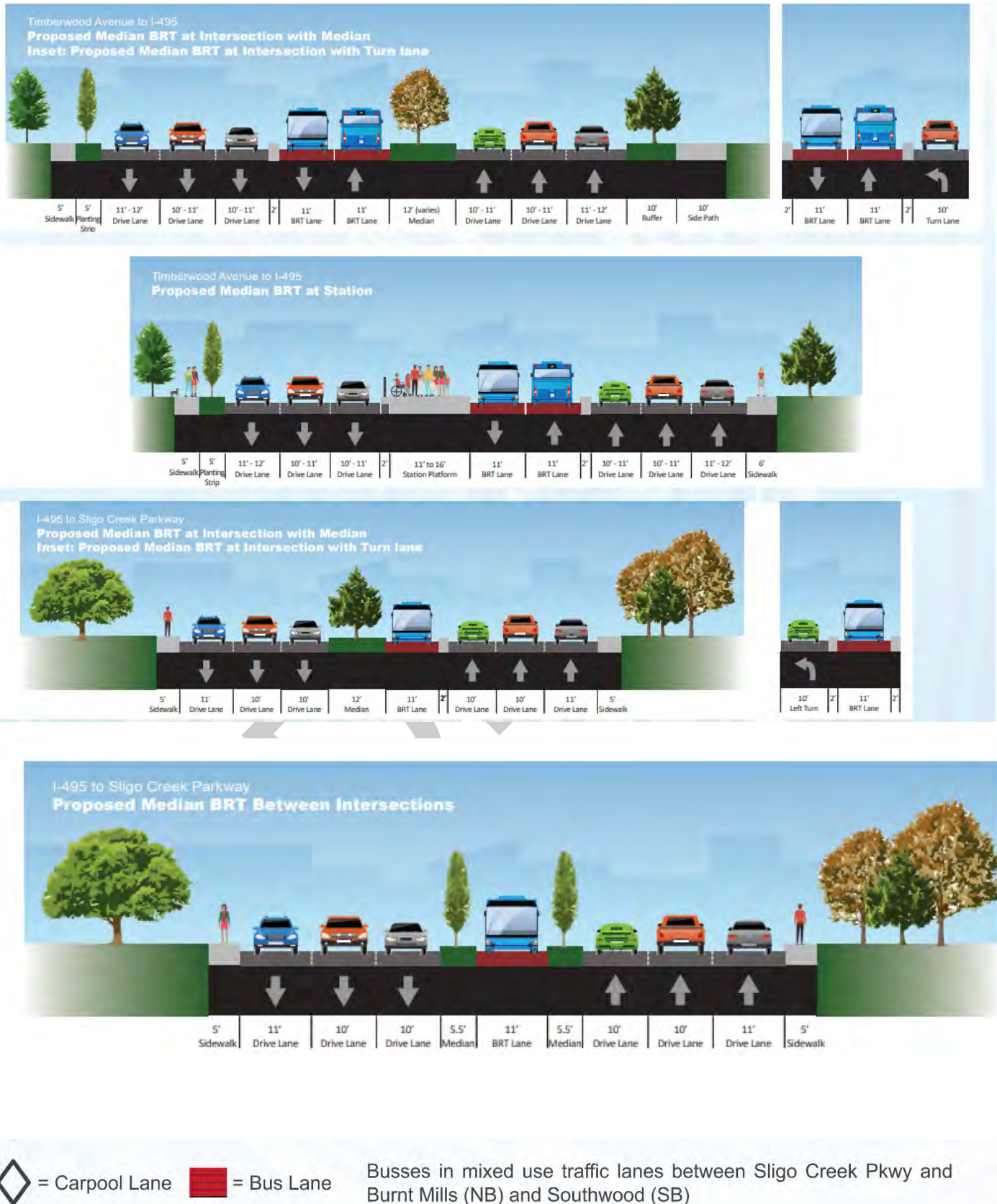


Table 16: 2025 Median Bus Lane Failing Intersections

Intersection	LOS	
	AM	PM
US 29 & Blackburn Rd	E	-
US 29 & Greencastle Rd	F	F
US 29 & Fairland Rd	E	-
US 29 & Musgrove Rd	-	-
US 29 & Tech Rd	F	F
US 29 & Industrial Pkwy	-	-
US 29 & Milestone Drive/Stewart Lane	-	E
US 29 & Prelude Drive	-	--
US 29 & Burnt Mills Avenue	-	-
US 29 & Lockwood Drive	-	-
US 29 & Burnt Mills Shopping Ctr	-	F
US 29 & Southwood Ave	F	-
US 29 & MD 193 Westbound	F	F
US 29 & MD 193 Eastbound	F	F
US 29 & Lanark Way	F	E
US 29 & Hastings Dr	-	E
US 29 & Franklin Ave	-	F
US 29 & Sligo Creek Parkway & St. Andrews Way	F	F
US 29 & MD 391 (Dale Dr)	F	F
US 29 & Spring St	F	F
US 29 & Fenton St	-	E
US 29 & Georgia Avenue	-	-
Colesville Rd & 2nd Ave/Wayne Ave	E	-

In addition to 17 failing intersections (two more than No Action conditions), 21 segments (same as No Action conditions) also experience failing link level of service in at least one peak hour.

Table 17: 2025 Median Bus Lane Failing Segments

		LOS			
US 29 Segment Limits		AM		PM	
North	South	SB	NB	SB	NB
Blackburn Rd	Greencastle Rd	E	-	-	-
Fairland Rd	Musgrove Rd	F	-	-	-
Musgrove Rd	Tech Rd	F	-	-	-
Tech Rd	Industrial Pkwy	F	F	-	E
Industrial Pkwy	Stewart Ln Slip Ramp	F	-	-	-
Stewart Ln Slip Ramp	Stewart Ln	F	-	-	-
Stewart Ln	Prelude	F	-	-	-
Prelude Dr	Burnt Mills Ave	F	-	-	-
Burnt Mills Ave	Lockwood Dr	F	-	-	-
Lockwood Dr	Burnt Mills SC	F	-	-	-
Burnt Mills SC	Southwood Ave	F	-	-	F
Southwood Ave	MD 193 WB	F	-	F	F
MD 193 WB	MD 193 EB	E	-	E	F
MD 193 EB	Lanark Way	F	F	F	F
Lanark Way	N. 495 Interchange	F	-	F	F
N. 495 Interchange	Franklin Ave	-	-	-	F
Franklin Ave	Sligo Creek Pkwy	F	-	F	F
Sligo Creek Pkwy	Dale Dr	-	F	F	F
Dale Dr	Spring	-	E	-	F
Spring St	Fenton St	-	F	F	F
Fenton St	Georgia Ave	-	E	F	F

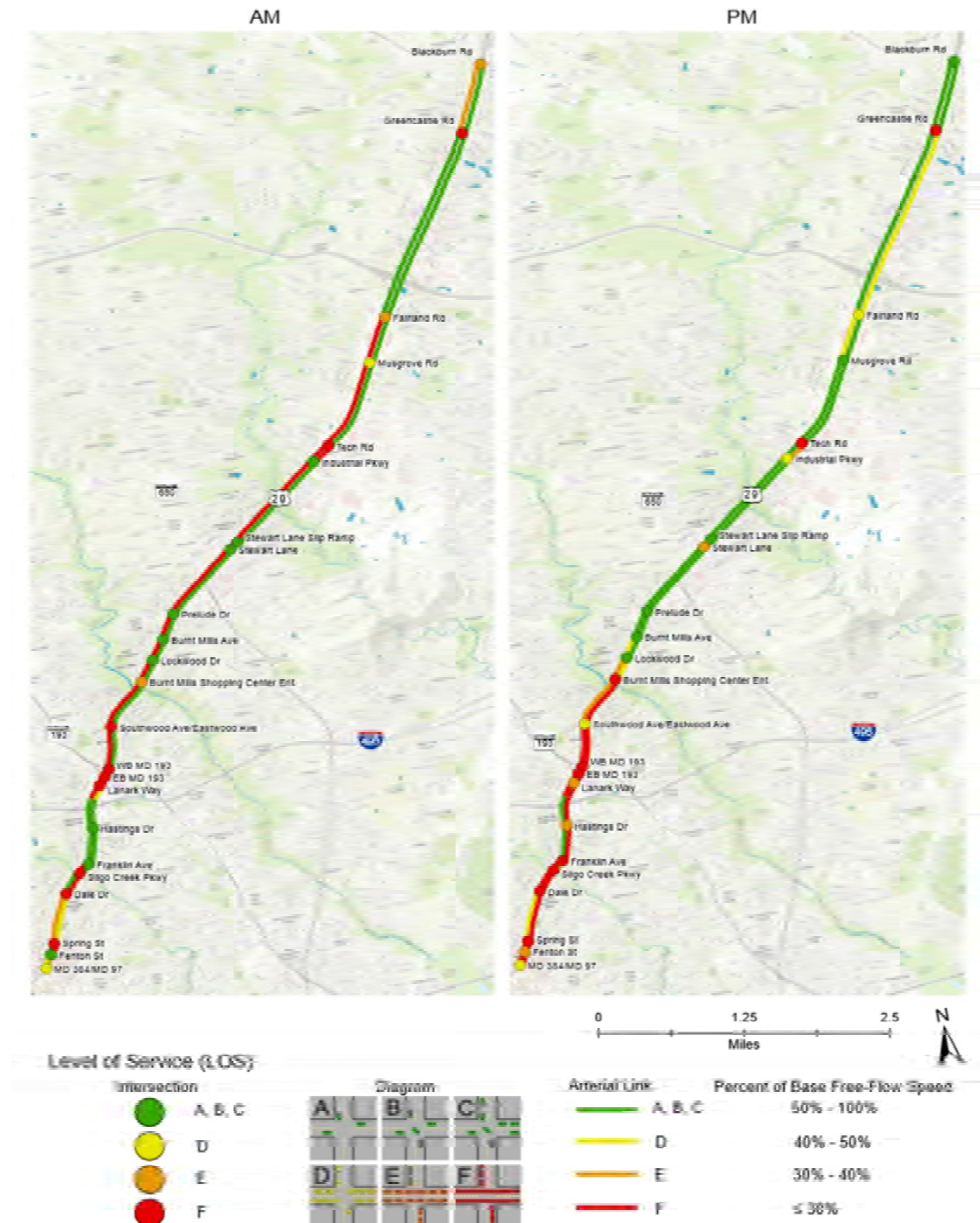


Figure 22: 2025 Median Bus Lane Link and Intersection Level of Service - Vehicles

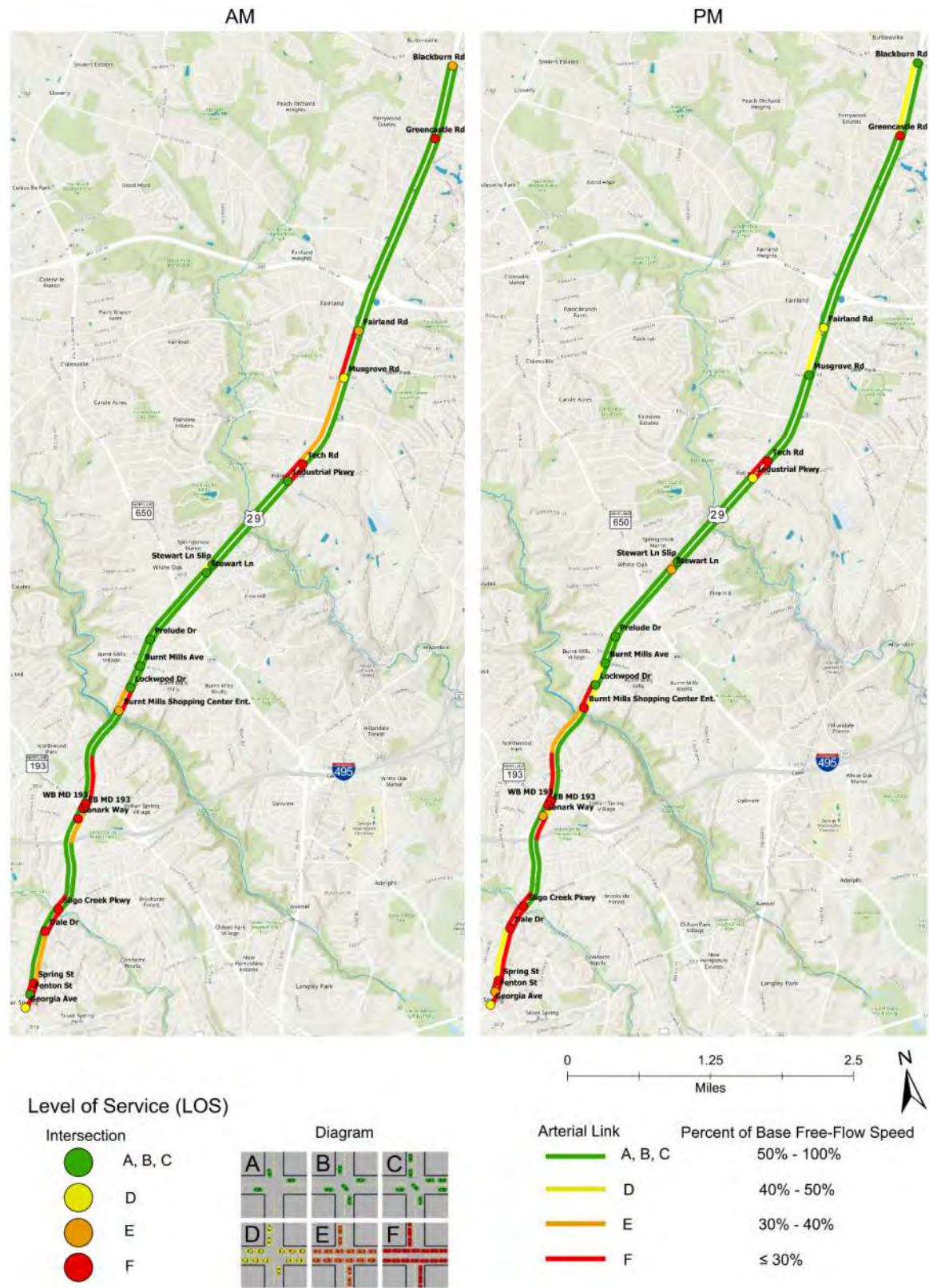


Figure 23: 2025 Median Bus Lane Link and Intersection Level of Service - BRT

Travel Times

Travel times for the 2025 Median Bus Lane scenarios for passenger vehicles and buses by peak period and travel direction are shown in **Figure 24** below. While savings over the No Action of about 15 minutes are realized in the southbound AM for buses, the median bus lane alternative does not provide any travel time savings in the northbound PM over the No Action condition.

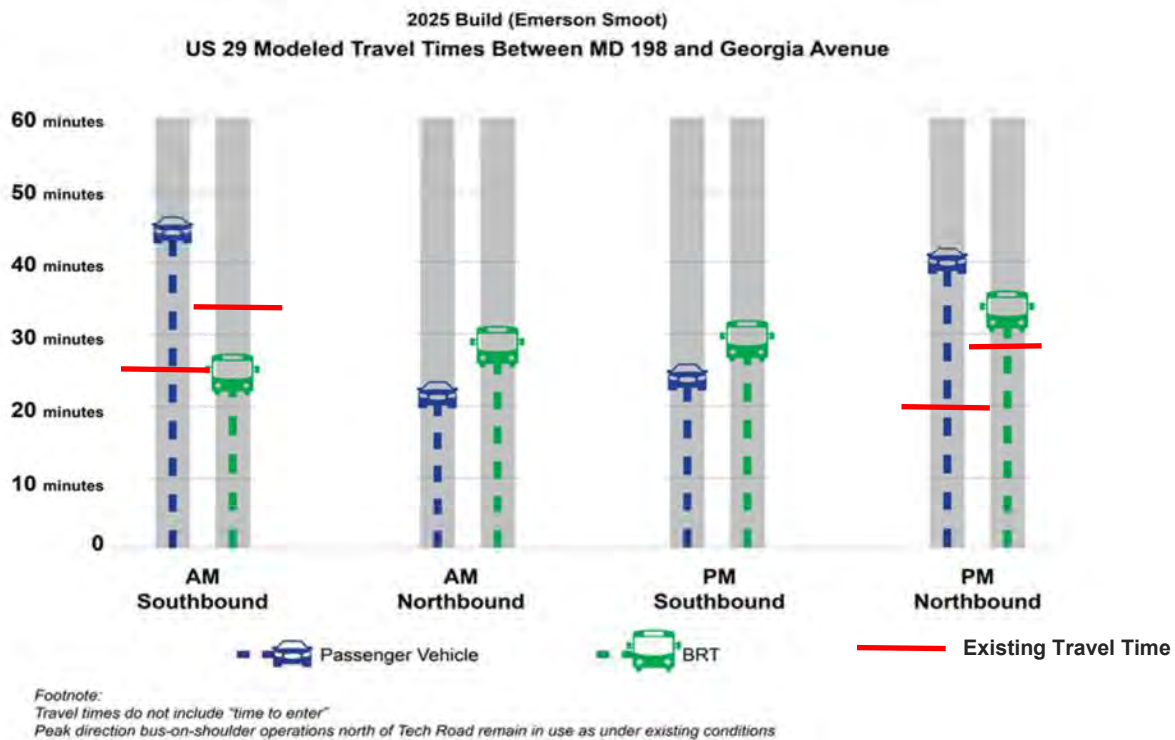


Figure 24: 2025 Median Bus Lane Travel Times Between MD 198 and Georgia Avenue

2025 Managed Lane Analysis

2025 Managed Lane Scenario

The managed lane concept is a combination of full-time bus/HOV lanes, peak period managed bus/HOV lanes, and hard shoulder running in multiple segments of the corridor. From Blackburn Road to Fairland Road, a full-time bus/HOV lane is proposed on the inner shoulder of both northbound and southbound US-29. From Musgrove Road to Stewart Lane, the inner lane becomes a bus/HOV lane in the southbound direction in the AM peak, with the outside shoulder being converted to a mixed-use lane. In the PM peak, the northbound inner lane becomes a bus/HOV lane and the outside shoulder is converted to a mixed-use lane. From MD 650 to Southwood Avenue, the inner lane becomes a bus/HOV lane in the southbound direction in the AM peak. In the PM peak, the northbound inner lane becomes a bus/HOV lane from Burnt Mills Avenue to MD 650. From Spring Street to Dale Drive, a managed lane is proposed. In the AM peak, there will be four southbound lanes, with the left lane serving as a bus/HOV lane, and two northbound lanes. In the PM peak, the northbound direction will have four lanes, with the inner lane serving as a bus/HOV lane. Typical sections of each segment are shown in **Figure 25**.

The components of the managed lane scenario are as follows:

- Full time Bus on left Shoulder from Blackburn Road to Fairland Road
- Peak Period/Direction HOV + Bus Managed Lane/Hard Running Shoulder from Musgrove Road to Stewart Lane
- Peak Period/Direction HOV + Bus Managed Lane from MD 650 to Southwood Ave (SB limit) / Burnt Mills Ave (NB limit)
- Peak Period/Direction HOV + Bus Managed Lane from Dale Drive to Spring Street

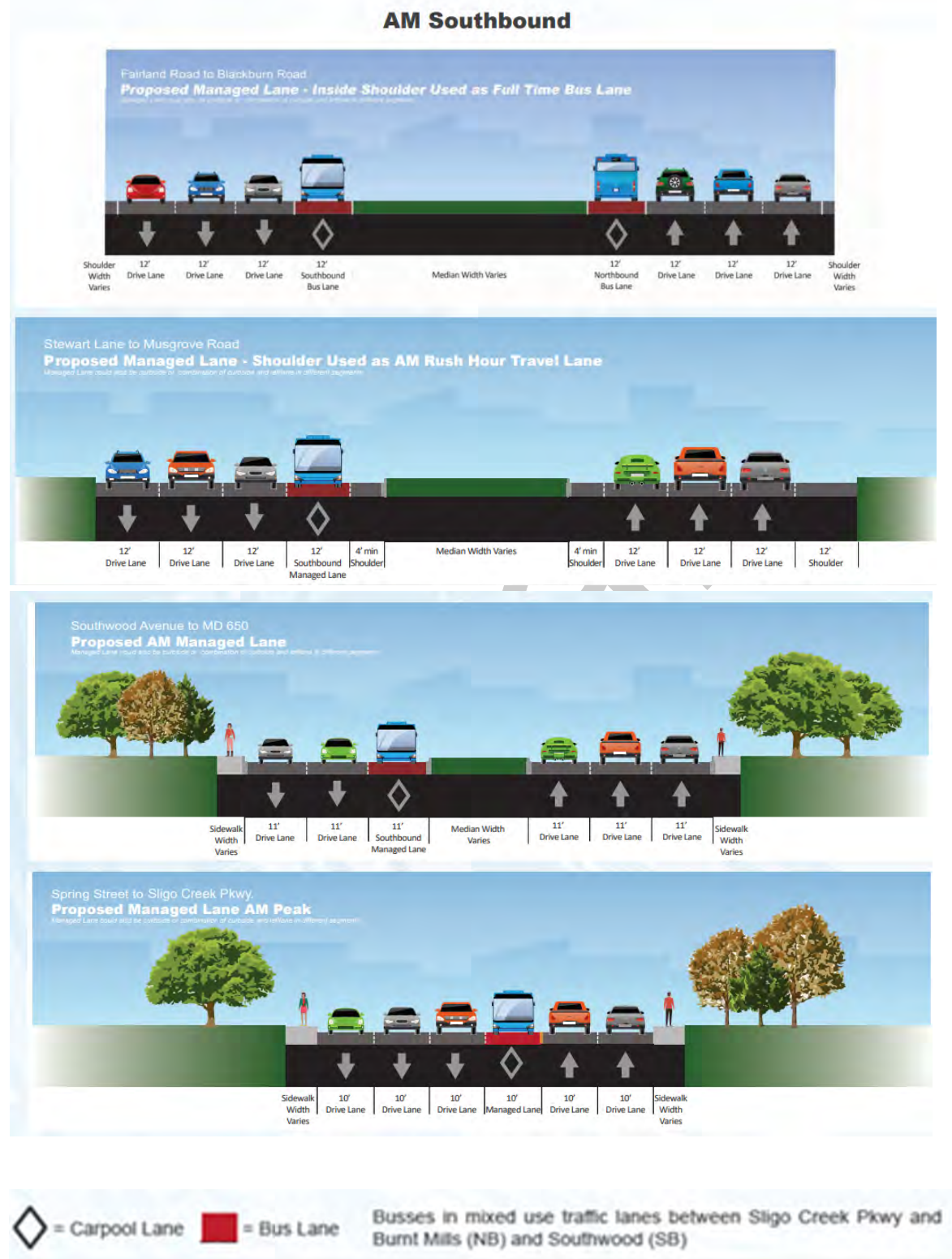
Geometric Design Elements, Impacts and Costs

The estimated construction cost for the managed lane alternative is \$50 million. The following impacts were noted based on the preliminary engineering design effort

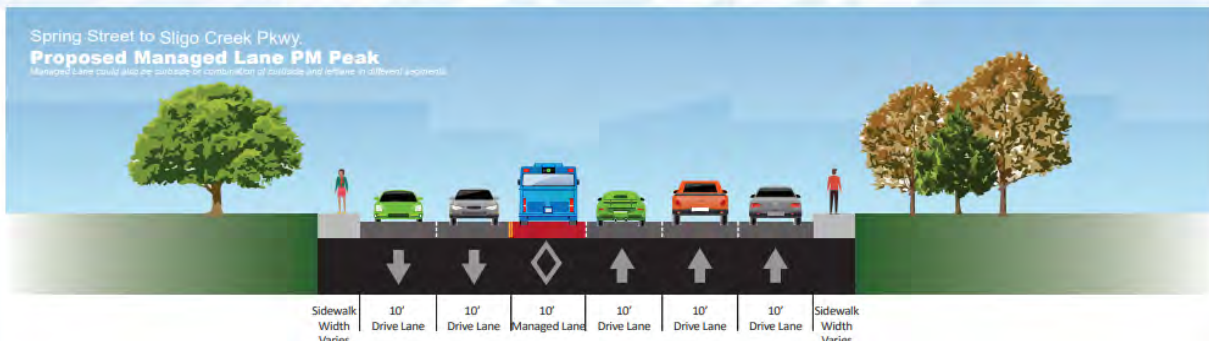
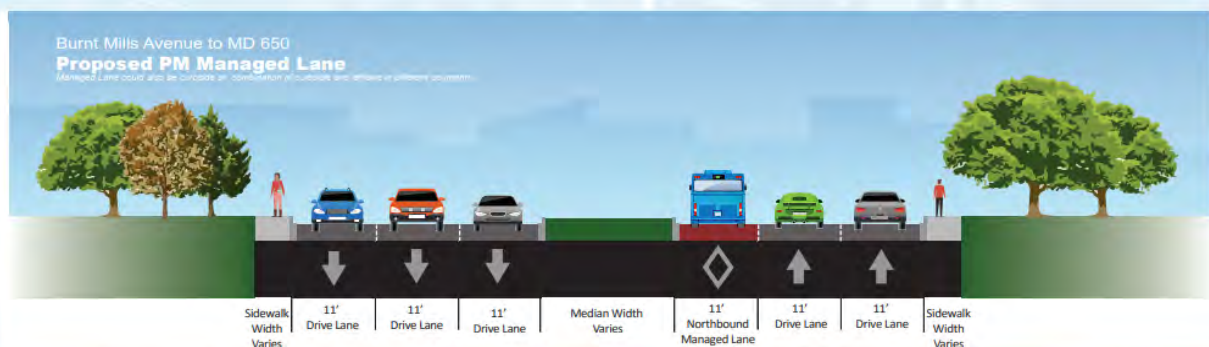
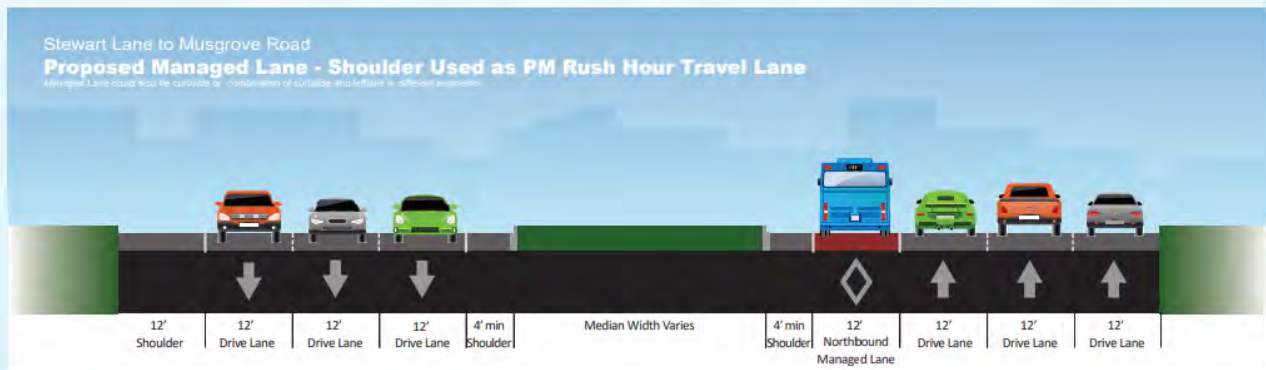
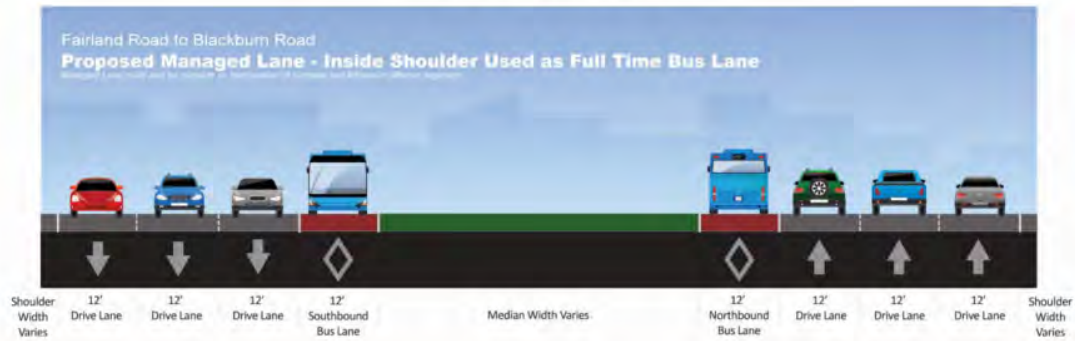
- Right-of-Way required: 2.2 Acres
- Utilities impacted: Various Underground and Overhead Utility Relocation in areas of Widening/Full Depth Reconstruction (Approximately \$7.7M)
- Design waivers: Bike Waiver south of MD 650 and where shoulders are used during peak periods
- Environmental impacts/ permitting: SWM / Roadside Tree Permit

Draft

Figure 25: Managed Bus Lane Typical Sections



PM Northbound



◊ = Carpool Lane ■ = Bus Lane

Busses in mixed use traffic lanes between Sligo Creek Pkwy and Burnt Mills (NB) and Southwood (SB)

Traffic Analysis Methodology

Intersection capacity analysis was performed at each study intersection under the 2025 Managed Lane scenario. Future 2025 turning movement volumes were coded into a Synchro network to perform capacity analysis using the same methodology described in the Existing Conditions section. The results summarize operations of each study intersection using the same key measures of effectiveness. The turning movement volumes were also updated in the VISSIM models.

2025 Managed Lane Results

Roadway Conditions and Traffic Operations

Arterial and intersection levels of service for the AM and PM Peak hours are shown in **Figure 26** below for vehicles and **Figure 27** for the BRT. Intersections which show a failing level of service (LOS E or LOS F) during at least one peak based on HCM methodology are shown **Table 18**. Only 7 intersections fail in at least one peak hour in the Managed Lane alternative, compared to 15 for the No Action and 17 for the Median Bus Lane. Seventeen segments fail in at least one peak hour, compared to 21 for the No Action and Median Bus Lane.

Table 18: 2025 Managed Lane Failing Intersections

Intersection	LOS	
	AM	PM
US 29 & Blackburn Rd	-	-
US 29 & Greencastle Rd	F	F
US 29 & Fairland Rd	E	-
US 29 & Musgrove Rd	-	-
US 29 & Tech Road	-	-
US 29 & Industrial Pkwy	-	-
US 29 & Milestone Drive/ Stewart Lane	-	-
US 29 & Prelude Dr	-	-
US 29 & Burnt Mills Ave	-	-
US 29 & Lockwood Drive	-	-
US 29 & Burnt Mills Shopping Center	-	-
US 29 & Southwood Ave	F	-
US 29 & MD 193 WB	-	-
US 29 & MD 193 EB	-	-
US 29 & Lanark Way	-	-
US 29 & Hastings Drive	-	-
US 29 & Franklin Ave	E	-
US 29 & Sligo Creek Parkway & St. Andrews Way	F	F
US 29 & MD 391 (Dale Dr)	F	F
US 29 & Spring St	F	F
US 29 & Fenton St	-	-
US 29 & Georgia Ave	-	-
Colesville Road & Wayne Ave/ 2nd Street	-	-

In addition to failing intersections, several segments also experience failing link level of service. Some of the failing links are due to intersection operations while others are due to congestion at ramp/merge areas with intersecting corridors. The link levels of service are based on percent of base free-flow speed were calculated from the VISSIM model outputs. The segments in **Table 19** fail in at least one direction during at least one hour:

Table 19: 2025 Managed Lane Failing Segments

US 29 Segment Limits		AM		PM	
North	South	SB	NB	SB	NB
Tech	Industrial	E	E	-	E
Industrial	Stewart Slip	F	-	-	-
Stewart Slip	Stewart	F	-	-	-
Stewart	Prelude	F	-	-	-
Prelude	Burnt Mills Ave	F	-	-	-
Burnt Mills Ave	Lockwood	F	-	-	-
Lockwood	Burnt Mills SC	E	-	-	-
Burnt Mills SC	Southwood	E	-	-	-
Southwood	MD 193 WB	F	-	-	-
MD 193 WB	MD 193 EB	F	-	-	-
MD 193 EB	Lanark	F	-	-	F
Lanark	N. 495 Interchange	F	-	-	E
Franklin	Sligo	E	-	F	-
Sligo	Dale	-	F	F	E
Dale	Spring	-	-	-	F
Spring	Fenton	-	F	F	E
Fenton	Georgia	-	-	E	-

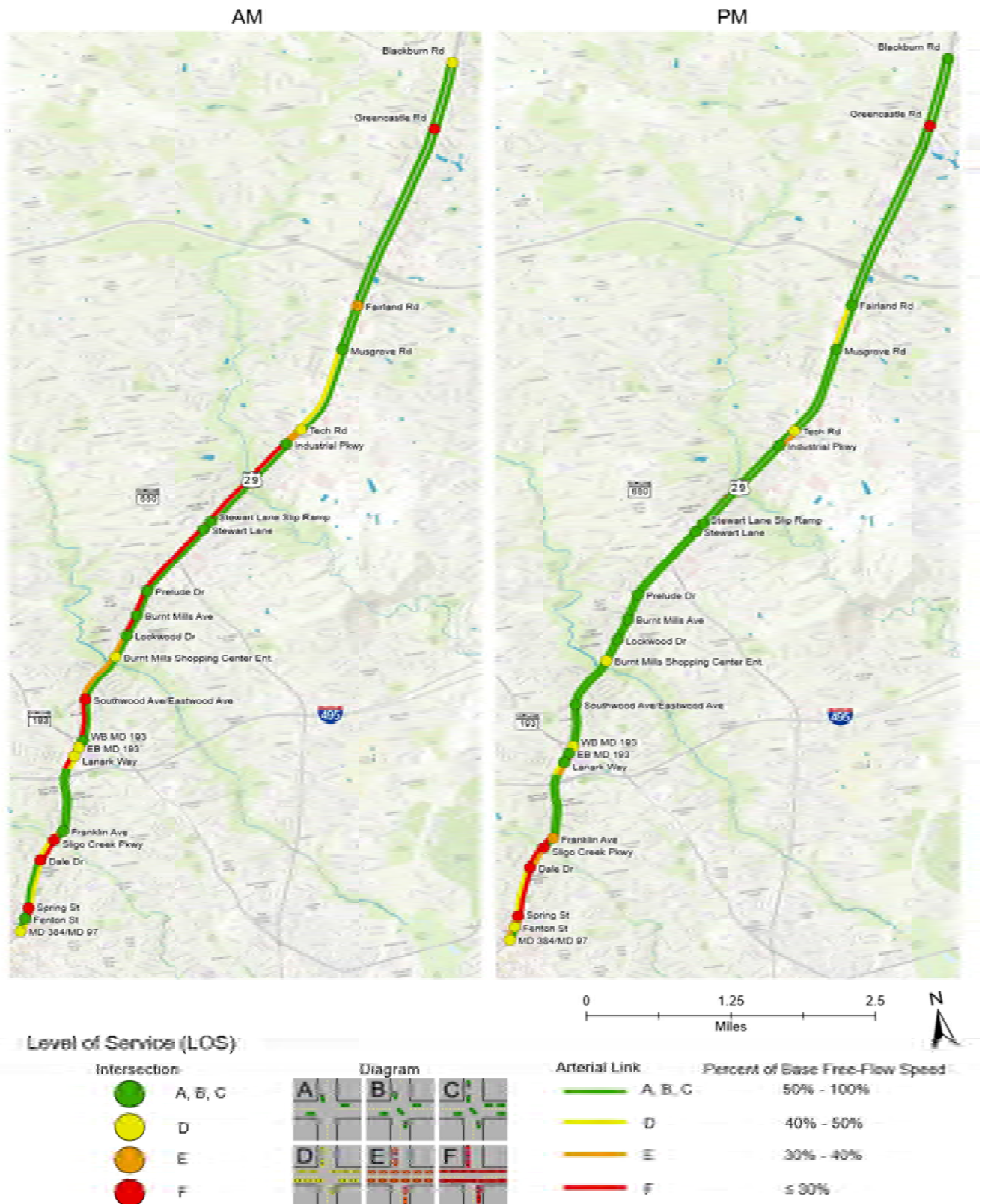


Figure 26: 2025 Managed Lane Link and Intersection Level of Service - Vehicles

US 29 Mobility & Reliability Study Technical Report

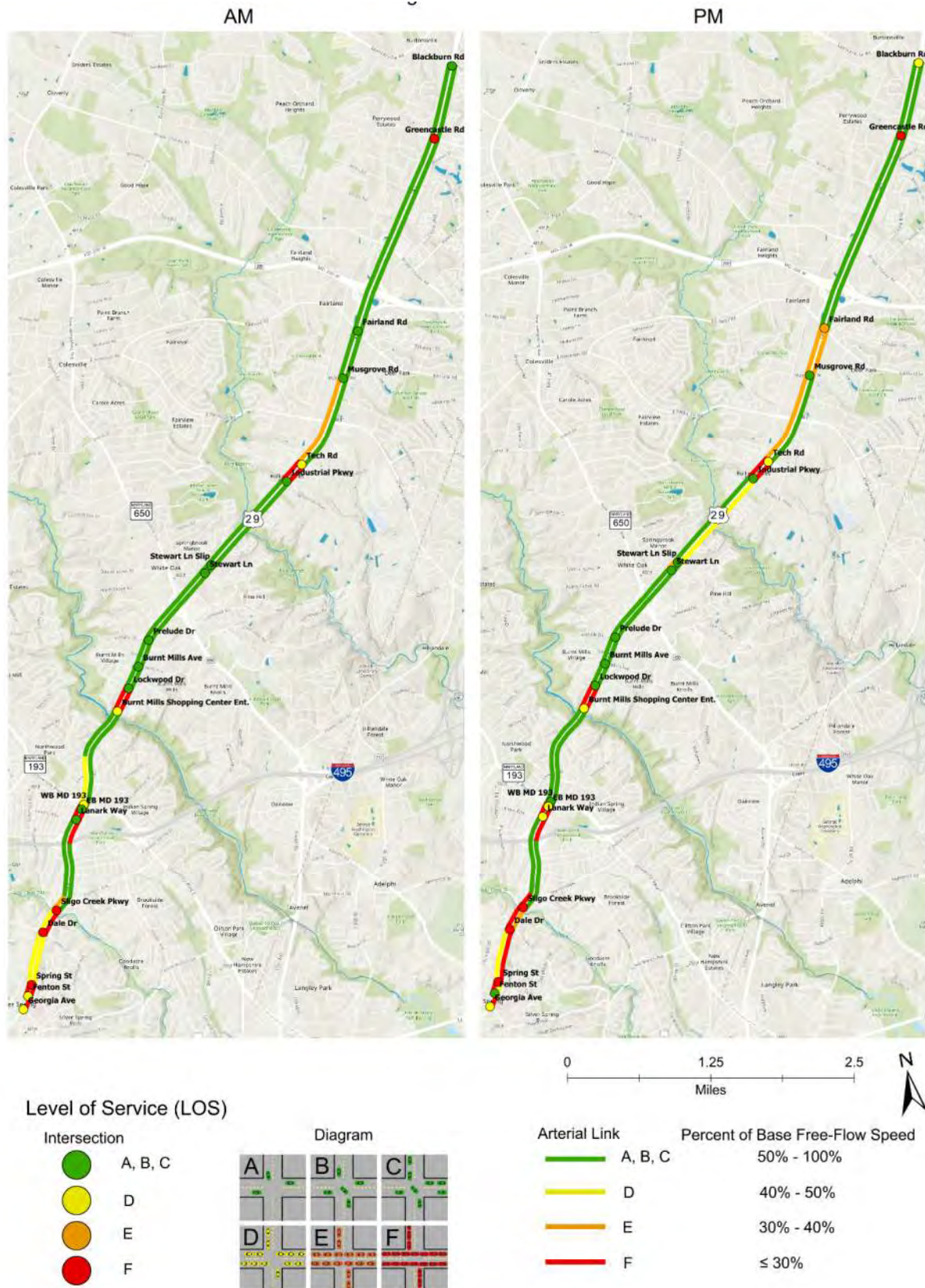


Figure 27: 2025 Managed Lane Link and Intersection Level of Service - BRT

Travel Times

Travel times for single occupancy passenger vehicles, high occupancy passenger vehicles, and buses by peak period and direction are shown in Figure 28 below. Travel times for buses and HOV are reduced by 20 and 15 minutes compared to the 2025 No Action, respectively in the southbound AM. In the northbound PM, travel time for all vehicles improves over the 2025 No Action by up to 10 minutes for buses and 15 minutes for passenger vehicles and HOV.

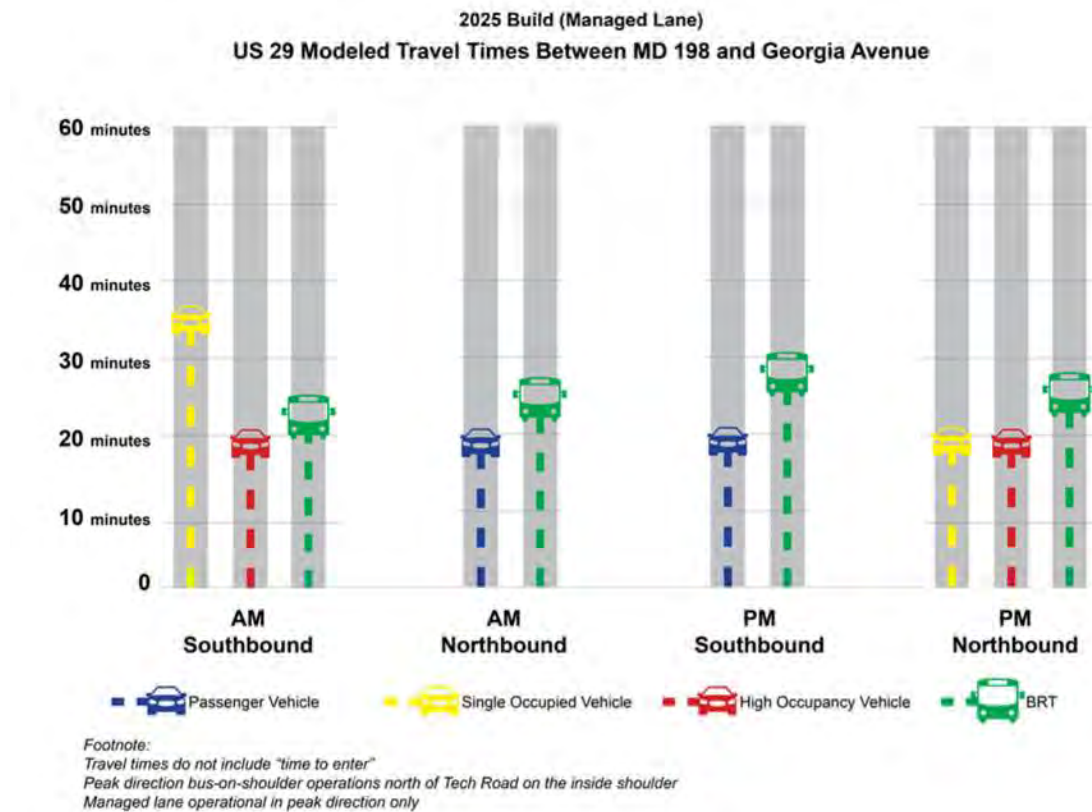


Figure 28: 2025 Managed Lane Travel Times Between MD 198 and Georgia Avenue

Comparison of Alternatives

The person throughout, travel times, and intersection level of service were compared for each alternative for the peak direction of each peak period. The results are summarized in **Figure 29**, **Figure 30** and **Figure 31** below. The managed lane/ HOV alternative moves 500 or more persons per hour per peak direction, provides faster bus travel times in both peak directions and improves intersection level of service (half fewer failing intersections) over the No Action and the Median Bus Lane option.

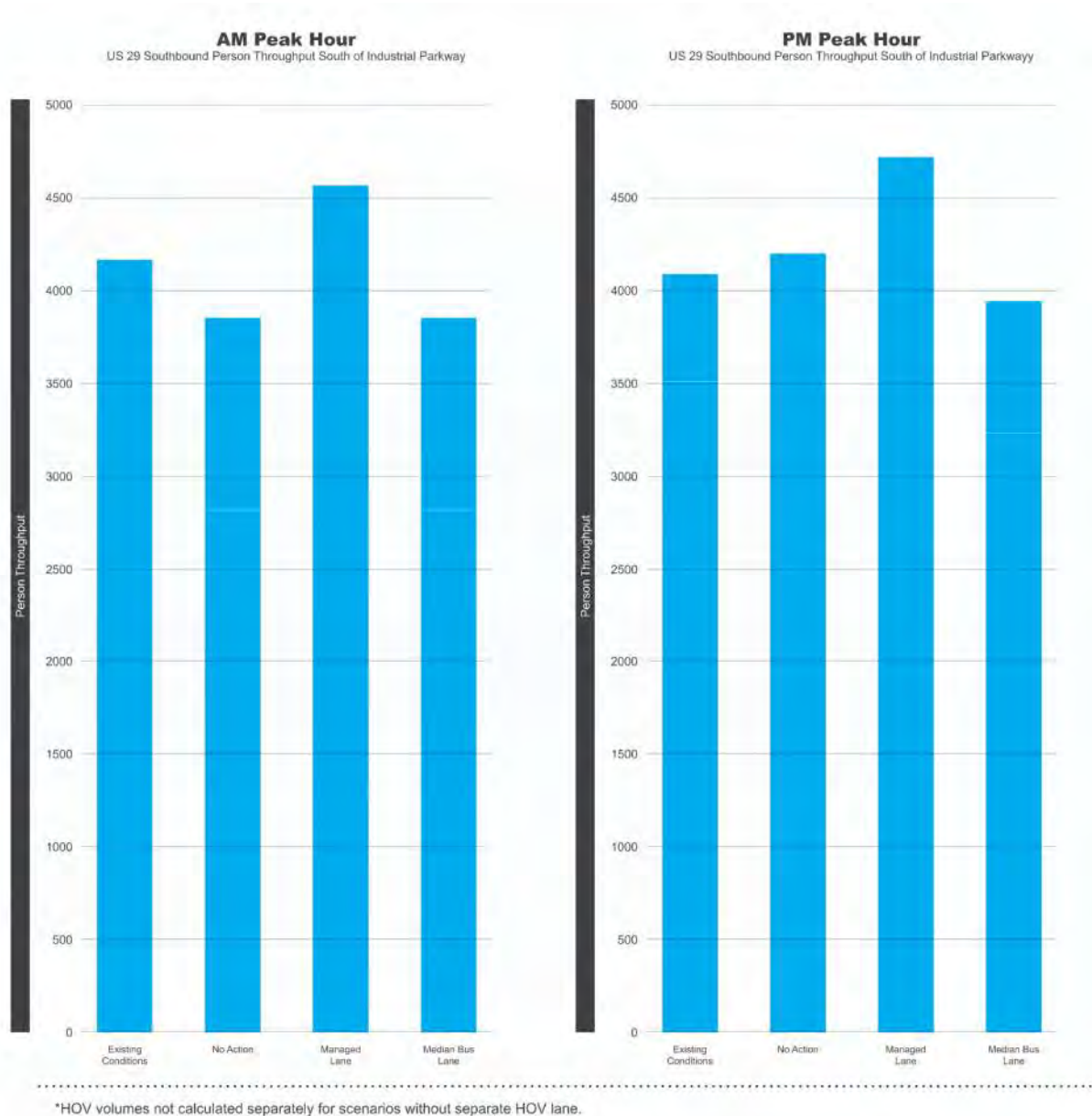
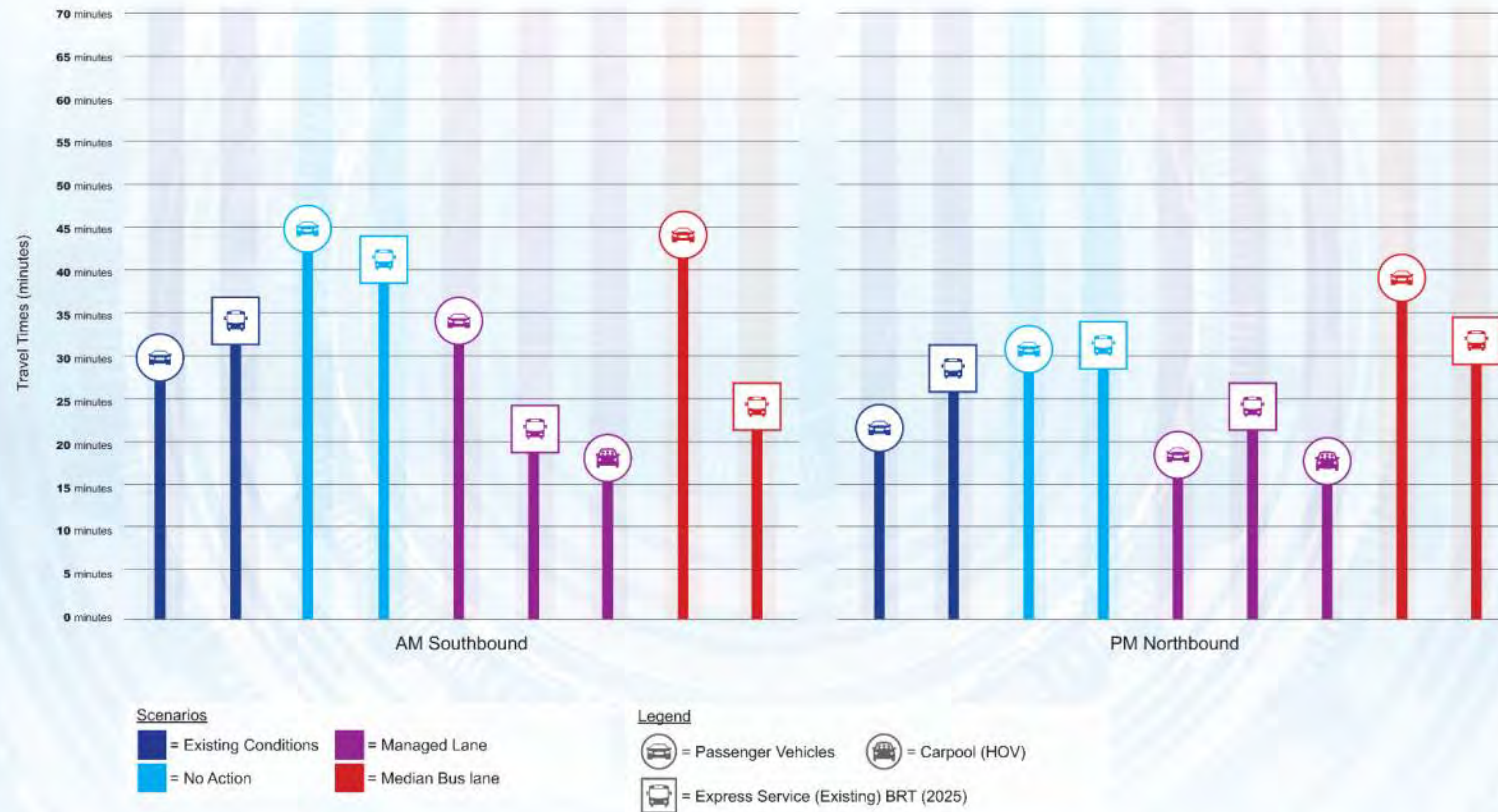


Figure 29: Person Throughput Comparison

Alternatives Comparison

Existing and 2025 Alternatives | Comparison Travel Time by Mode (MD 198 to Georgia Ave)



US 29 Mobility & Reliability Study

MCDOT
Maryland Department of Transportation

Figure 30: Travel Time Comparison

Figure 31: Intersection Level of Service Comparison

Intersection	No Action LOS		Median Bus Lane LOS		Managed Lane LOS	
	AM	PM				
US 29 & Blackburn Rd	E	-	E	-	-	-
US 29 & Greencastle Rd	F	F	F	F	F	F
US 29 & Fairland Rd	E	-	E	-	E	-
US 29 & Musgrove Road	-	-	-	-	-	-
US 29 & Tech Rd	F	F	F	F	-	-
US 29 & Industrial Parkway	-	-	-	-	-	-
US 29 & Milestone Drive/Stewart Lane	-	E	-	E	-	-
US 29 & Prelude Drive	-	-	-	--	-	-
US 29 & Burnt Mills Avenue	-	-	-	-	-	-
US 29 & Lockwood Drive	-	-	-	-	-	-
US 29 & Burnt Mills Shopping Ctr	E	F	-	F	-	-
US 29 & Southwood Ave	F	-	F	-	F	-
US 29 & MD 193 Westbound	-	-	F	F	-	-
US 29 & MD 193 Eastbound	E	-	F	F	-	-
US 29 & Lanark Way	E	-	F	E	-	-
US 29 & Hastings Drive	-	-	-	E	-	-
US 29 & Franklin Ave	-	F	-	F	E	-
US 29 & Sligo Creek Parkway & St. Andrews Way	F	F	F	F	F	F
US 29 & MD 391 (Dale Dr)	F	F	F	F	F	F
US 29 & Spring St	F	F	F	F	F	F
US 29 & Fenton St	-	E	-	E	-	-
US 29 & Georgia Avenue					-	-
Colesville Rd & 2nd Ave/Wayne Ave	E	-	E	-	-	-

Summary of Findings and Recommended Mobility Package

Summary of Findings

The US 29 Mobility and Reliability study documented existing land use, demographics, corridor travel patterns, previous studies and recommendations, transit service, walking and biking connections and gaps and traffic operations analysis (level of service, travel time and person throughput). A menu of mobility and reliability improvements were identified and evaluated to compliment the investment in FLASH bus service as well as enhance carpool, overall corridor travel time, as well as pedestrian and bicycle access from Tech Road to Silver Spring. The improvement options included intersection/ roadway capacity expansions, new/ upgraded pedestrian and bicycle infrastructure, traffic management and traveler information strategies, and corridor-wide bus priority geometric and operational treatments.

The findings indicate:

- Average daily traffic volumes along US 29 vary from 60,000 to 70,000
- The corridor is served by three transit operators (WMATA, RideOn and MTA) and there are between 7,000 to 8,000 bus passengers per day.
- Passenger vehicle travel times in the corridor from Tech Road to Georgia Avenue range from under 15 minutes in the off-peak direction to over 25 minutes in the peak direction.
- Several roadway sections in the US 29 corridor exceed their volume to capacity ratio under existing conditions.
- Several intersections operate with a LOS E or LOS F during at least one peak hour (US 29 at Tech, Burnt Mills Shopping Center, Southwood, Sligo Creek Parkway, Dale Drive and Spring Street)
- Over 30 previous studies were conducted in the corridor by the County or State over the past two decades recommending dozens of roadway, transit, pedestrian and bicycle improvements
- The eight Flash stations evaluated in this report were found to have significant gaps and barriers in pedestrian and bicycle accessibility. The station area (1/2 mile radius) serves between 9,000 households and 20,000 jobs in downtown Silver Spring to 700 households and 2,200 jobs in Tech Road
- The existing number of households (53,115) and jobs (61,880) are expected to grow to 64,893 households (21%), and 89,403 jobs (44 %) by 2040.
- Without any roadway improvements or shift in mode by 2040 every intersection in the corridor will operate at a LOS E or F in at least one peak hour, and travel times will double.
- Six major intersection/ interchange improvements were identified to remove critical bottlenecks
- Two corridor-wide bus priority options were evaluated, including a median bus lane and a managed bus / HOV lane to provide reliable transit operations
- Over 200 individual pedestrian and bicycle improvements were identified
- A suite of traffic management and traveler information strategies were identified
- The median bus lane alternative cost exceeded \$100 million and included significant right-of-way and utility impacts. Operationally, travel time savings were limited for buses, and all intersections were anticipated to operate at a LOS E or F (it should be noted that intersection improvements were not included in the analysis).

- The managed lane alternative cost was approximately \$50 million. Operationally, travel time savings of up to 15 minutes were predicted for transit and carpool modes. Only seven study intersections remained at a LOS E or F with the intersection/ interchange improvements included.
- Person throughput increased by over 500 persons per hour for the managed lane alternative compared to existing, No Action and median bus lane alternative

Recommendations and Phasing

Based on the results of the analysis, the managed bus/HOV lane alternative, in combination with the intersection improvements, is expected to perform better than the median bus lane for in year 2025 for overall traffic operations, person throughput and travel time reliability. The managed bus lane also costs at least \$50 million less than the median bus lane with fewer right-of-way, utility, stormwater and environmental permitting impacts.

The following mobility package and phasing is recommended for implementation:

Musgrove Road to Stewart Lane:

Peak period/ peak direction managed bus /HOV lanes and hard shoulder running

MD 650 to Southwood Avenue (SB) and Burnt Mills Avenue (NB):

Peak period/ peak direction managed bus /HOV lanes

Dale Drive to Spring Street:

Convert reversible lane to peak period/ peak direction bus/ HOV lanes

In addition to the managed lanes, **intersection improvements** at Greencastle Road, Tech Road, Stewart Lane, and Sligo Creek Parkway, as well as **interchange improvements** at MD 650 and I-495

A managed lane from Blackburn Road to Fairland Road is not recommended, as the interchange construction at Blackburn Road, Greencastle Road, and Fairland Road necessitated by the managed lane would be more costly than the benefit the managed lane would provide.

Mobility package phasing is suggested as follows:

Short-term Recommendations:

- Prioritize pedestrian and bicycle improvements around bus stops
- Design and construct improvements at Greencastle Road, Tech Road, Stewart Lane, MD 650, Burnt Mills Avenue, I-495 (choice exit lane) and Sligo Creek Parkway.
- Implement technology-focused Traffic Management Solutions

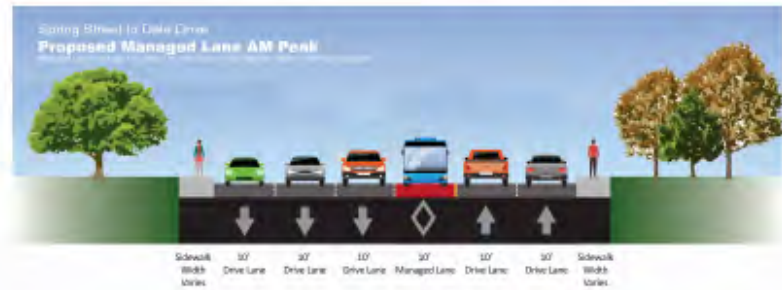
Mid-term Recommendations: Bus priority design elements.

- Bus/HOV managed lane, peak period hard shoulder running from Tech to Stewart Lane.
- Peak period bus/HOV managed lane from MD 650 to Southlawn/ Burnt Mills

The total project cost is \$100 million - \$20 million (pedestrian/ bicycle), \$5 million (traffic management) \$25 million (intersection/ interchange improvements) and \$50 million (bus priority improvements). Figure 32 illustrates the recommended improvements by segment.

Sligo Creek Pkwy to Spring Street
Peak Period/Direction HOV + Bus Managed Lane

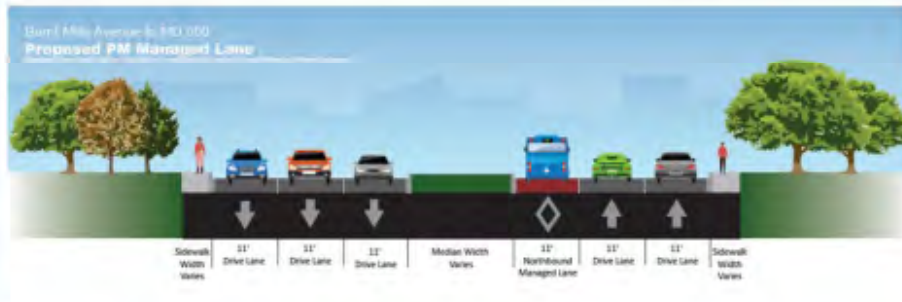
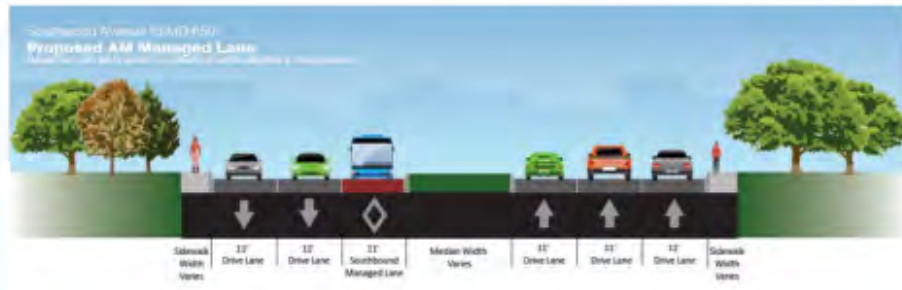
\$0.5-1.5M Construction



MD 650 to Southwood (SB) and Burnt Mills (NB)
Peak Period/Direction HOV + Bus Managed Lane

\$4.0-5.0M Construction

- MD 650 to Burnt Mills
- Burnt Mills to Southwood



Musgrove to Stewart
Peak Period/ Direction HOV + Bus Managed Lane/Hard Running Shoulder

\$45-50M Construction

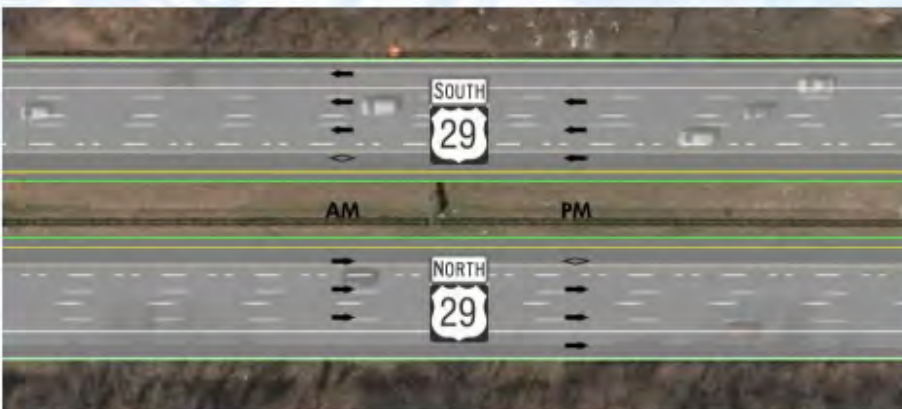
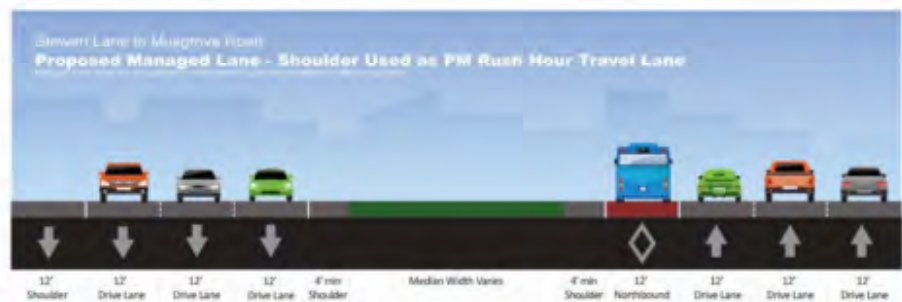






Figure 32: Mobility Package Recommendations by Segment

Attachment B: Staff Report for 65% Design for the US 29 Bus Rapid Transit Project (MR2018038, July 2018)

Mandatory Referral for the US 29 Bus Rapid Transit Project, MR2018038

 David Anspacher, Supervisor, david.anspacher@montgomeryplanning.org, 301-495-2191
 Rebecca Ballo, Supervisor, rebecca.ballo@montgomeryplanning.org, 301-563-3404
 Amy Lindsey, Planner Coordinator, amy.lindsey@montgomeryplanning.org, 301-495-2189
 Pam Dunn, Chief, pamela.dunn@montgomeryplanning.org, 301-650-5649

Completed: 07/19/2018

DESCRIPTION

This project will implement a 14-mile bus rapid transit (BRT) corridor between the Silver Spring Transit Center and the Burtonsville Park-and-Ride.

- Location: US 29 Corridor, and some local streets, between Burtonsville Park-and-Ride and Silver Spring Transit Center
- Master Plan: 2013 Countywide Transit Corridors Functional Master Plan
- Acceptance Date: June 25, 2018
- Applicant: Montgomery County Department of Transportation
- Review Basis: Mandatory Referral, MD Land Use Code § 20-301

RECOMMENDATIONS

Staff recommends approving this mandatory referral with the following comments:

To improve walking and bicycling access to the US 29 bus rapid transit stations, consider adding four bicycle and pedestrian projects to the capital budget:

- Sidewalks on National Drive between the Burtonsville Park-and-Ride station and Burtonsville Town Center.
- One-way separated bike lanes on Castle Boulevard between Briggs Chaney Road and Castle Ridge Circle.
- A shared use path on Lockwood Drive from US 29 to Northwest Drive.
- A shared use path on the east side of US 29 between Lockwood Drive and the southern entrance to the Burnt Mills Shopping Center (aka Tom's Drive).

In addition, staff has several station-specific comments:

General

- Upgrade the proposed bike rack at each station with weather-protected shelters.

Fenton Street Station

- At the southbound platform, construction of the Fenton Street Station and associated paving, signage and any railings or other alterations will require a Historic Area Work Permit (HAWP) and approval by the Historic Preservation Commission (HPC).
- At the northbound platform, consider whether ADA compliant warning devices or barriers are needed on the south side of the station platform to provide safety for people with vision and mobility challenges.

Four Corners Station

- At the northbound platform, align the ramps to maintain a 10-foot-wide clear space for the planned shared use path.

Oak Leaf Drive Station

- At the southbound platform, show the existing sidewalk connecting Lockwood Drive to the proposed bikeshare station and widen the sidewalk to 5 feet adjacent to the bikeshare dock to enable users to pull bikes from the dock.
- At the southbound platform, consider working with the property owners to straighten out and widen the sidewalk section between the Oak Leaf Drive Station and Oak Leaf Drive.

Stewart Lane

- Consider the use of green paint to denote conflicts areas on the pavement for the separated bike lanes proposed at the Stewart Lane station.

Tech Road Station

- Provide a 10-foot-wide pedestrian refuge in the median with protection from traffic (aka a bull nose).
- At the northbound platform, the buffer between the sidewalk and US 29 should be at least 5 feet wide.
- At the northbound platform, provide a more gradual transition between the curb ramp and the sidewalk to the Tech Road Station.
- At the northbound platform, on the north side of Tech Road between US 29 and Prosperity Drive, shift the sidewalk to the north behind the existing utility pole to create a buffer from traffic.

Castle Boulevard Station

- Provide weather-protected bike racks directly adjacent to the station.

Briggs Chaney Park-and-Ride Station

- Provide weather-protected bike racks directly adjacent to the station.

Burtonsville Park-and-Ride Station

- Per zoning regulations, one-way drive aisles adjacent to parking spaces oriented at 60-75 degrees must be 18 feet wide, not 17 feet wide as shown. Revise the parking angle or increase the width of the one-way drive aisle.
- Per zoning regulations, the current parking spaces as dimensioned (60-degree angle, 8.5 feet wide, 21 feet in length) can only be used for compact cars. Label the parking accordingly or update the dimensions for standard vehicles per the zoning code.

BACKGROUND

Bus Rapid Transit (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 Metroway in Alexandria, Virginia has dedicated bus lanes in the median (Source: BeyondDC)

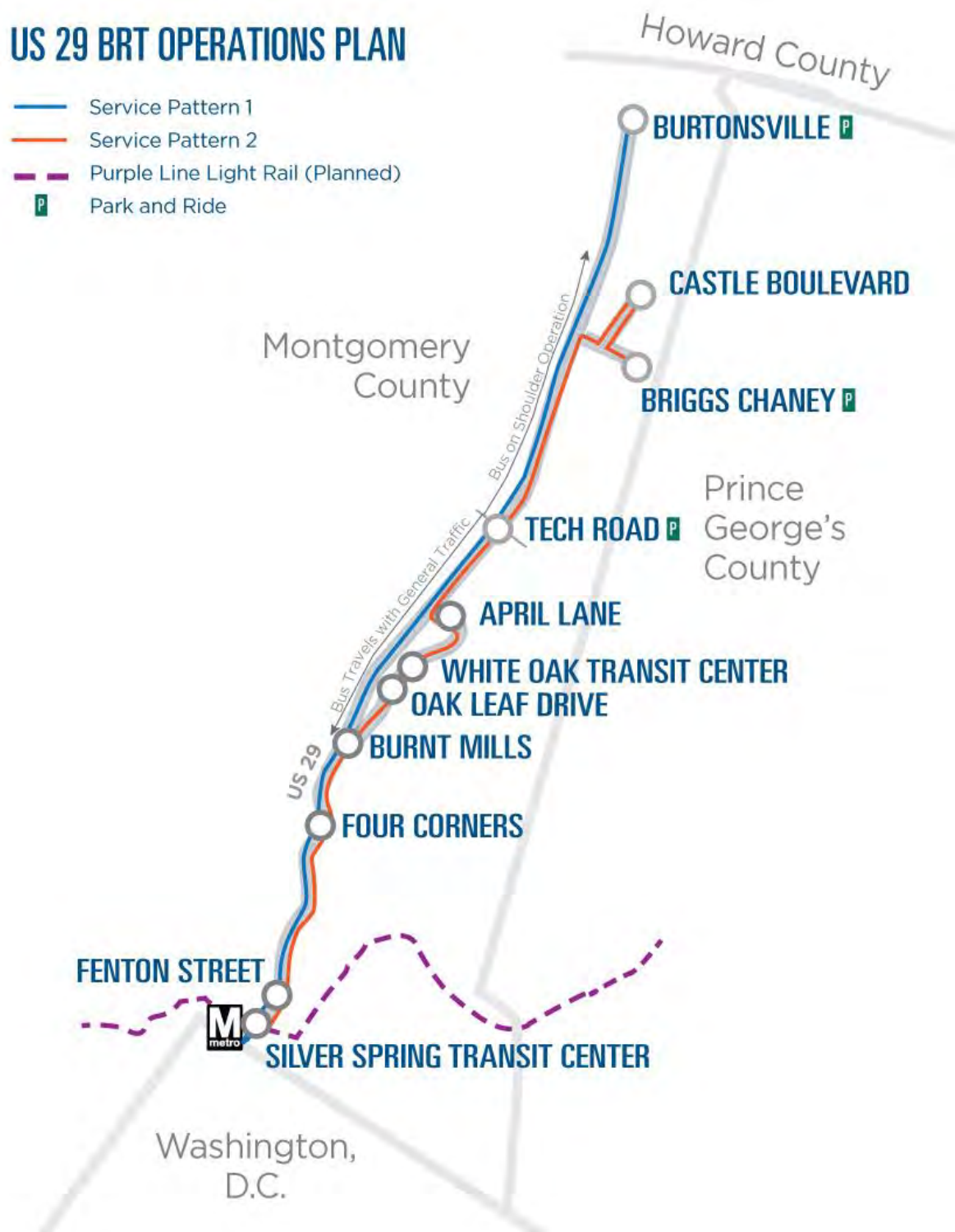
The 2013 Countywide Transit Corridors Functional Master Plan and amendments, including the 2014 White Oak Science Gateway Master Plan, are the guiding policy documents for BRT in Montgomery County along US 29. The functional master plan identifies 10 bus rapid transit corridors and includes recommendations 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.

PROJECT DESCRIPTION

The US 29 Bus Rapid Transit Project proposes a 14-mile Bus Rapid Transit (BRT) line along US 29 and local streets, from the Silver Spring Transit Center (SSTC) to the Burtonsville Park-and-Ride, as shown on in Figure 1 below. The project has evolved from a previous conceptual plan, the US 29 Corridor Planning Study: Corridor Report (Maryland Department of Transportation, April 2017), and is currently being advanced by the Montgomery County Department of Transportation (MCDOT) in cooperation with the Federal Transit Administration. This \$31.5 million project is funded through County and federal funds, including a \$10 million federal Transportation Investment Generating Economic Recovery (TIGER) grant from the Federal Transit Administration.

Figure 1: US 29 Bus Rapid Transit



The project includes six main components:

- New Limited Stop Transit Service: The project will add new limited stop bus service along US 29, with 11 stops between the Burtonsville Park-and-Ride and the Silver Spring Transit Center. As currently envisioned, there will be two routes (see Figure 1):
 - Service Pattern 1: The Burtonsville Service will operate buses along US 29 from the Burtonsville Park-and-Ride to the Silver Spring Transit Center during weekday peak hours (5 to 9 AM and 3:30 to 7:30 PM) and will stop at these stations: Burtonsville Park-and-Ride, Tech Road, Burnt Mills, Four Corners, Fenton Street and the Silver Spring Transit Center. Buses will run every 15 minutes.
 - Service Pattern 2: The Briggs Chaney Service will operate between the Briggs Chaney Park-and-Ride and the Silver Spring Transit Center from 5 AM to midnight on weekdays and from 7 AM to midnight on weekends and will stop at these locations: Briggs Chaney Park-and-Ride, Castle Boulevard, Tech Road, April Lane, White Oak Transit Center, Oak Leaf Drive, Burnt Mills, Four Corners, Fenton Street and the Silver Spring Transit Center. Buses will run every 15 minutes.

Buses will run every 7.5 minutes during the peak period at stations shared by both service patterns and every 15 minutes during the off-peak periods.

- Dedicated Transit Lanes: Buses will operate on the existing outside shoulders during congested periods between MD 198 in Burtonsville and Tech Road, a distance of about five miles.



Shoulder busway in the Minneapolis-St Paul area (Source: MetoTransit)

- High-Quality Transit Stations: The project will construct 11 high-quality stations along the corridor that will include weather protection, prepayment stations and real time information about bus arrivals via message boards. See Attachment A for station locations. A prototype of the stations is shown below.



Prototype BRT Station in Montgomery County

- High-Quality Transit Vehicles: The project will purchase articulated low-floor buses (for easy on and off), with multiple doors, WiFi and USB ports and onboard storage for bicycles.
- Transit Signal Priority (TSP): Transit signal priority is a set of operational improvements that use technology to reduce transit vehicle delay at traffic signals by extending green lights or shortening red lights. TSP will be provided at a minimum of 15 of the 31 signalized intersections along the US 29 study corridor.
- Station Access Improvements: The project proposes improvements to the bikeways and sidewalks around several stations. It also will provide 10 Capital Bikeshare stations, with six stations located at the BRT stations and four located in the surrounding areas.

The project schedule includes the following next steps:

- October 2018: Complete 100% design.
- Late October / November 2018: Ceremonial groundbreaking.
- Spring 2019: Full construction underway.
- Early 2020: Project completion.

PREVIOUS STUDIES

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

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

US 29 MOBILITY AND RELIABILITY STUDY

As a separate effort, in early 2018, the Montgomery County Council asked the Montgomery County Department of Transportation to consider ways to improve mobility and reliability along US 29 for all modes of transportation, including the feasibility of a dedicated bus lane in the median of the roadway. The US 29 Mobility and Reliability Study will evaluate the median bus lane option, station access improvements and other improvements along US 29 that could increase the operational efficiency of the roadway and benefit users of the road, including BRT vehicles.

Irrespective of this study, the US 29 BRT project will move ahead on its current schedule with construction scheduled to begin in fall 2018. Any improvements that are found to have merit in the US 29 Mobility and Reliability Study would move forward as separate efforts on their own timeline and with separate funding. Of the 11 stations being constructed for the US 29 BRT project, only two (Four Corners and Burnt Mills) would potentially be impacted by a median bus lane concept that will be considered in the Mobility and Reliability Study. Since the stations are modular by design, most of the station elements could be moved to a new location if needed to accommodate future projects on US 29.

ANALYSIS

The US 29 Bus Rapid Transit project will provide substantial benefits to existing and new transit riders along the US 29 corridor for a modest cost. As the first bus rapid transit project in the County, it represents an important step toward the creation of Montgomery County's planned bus rapid transit network. The provision of limited stop service, dedicated shoulder transit lanes, transit signal priority and low-floor buses with multiple doors and off-board fare collection will reduce travel times between 22 and 35 percent compared with local bus service. Furthermore, the project will increase the convenience of transit by providing weather protected stations, low-floor boarding, onboard WiFi and USB ports and on-board storage for bicycles.

Master Plan Consistency

The US 29 corridor is one of the 10 corridors identified in the 2013 Countywide Transit Corridors Functional Master Plan as a transit corridor (see Attachment C). The plan recommends stations at 11 locations:

1. Burtonsville Park-and-Ride
2. Briggs Chaney Park-and-Ride
3. US 29 and Fairland Road
4. US 29 and Tech Road
5. White Oak Transit Center
6. Lockwood Drive and Oak Leaf Drive
7. US 29 and Hillwood Drive
8. US 29 and MD 193
9. US 29 and Franklin Avenue
10. US 29 and Fenton Street
11. Silver Spring Transit Center

The plan also recommends dedicated transit lanes for the entire length of US 29, from MD 198 to 16th Street. It states that north of Stewart Lane the transitway could be provided by adding up to two additional lanes and that south of Stewart Lane, the transitway would be provided by converting existing general-purpose lanes to BRT lanes. Furthermore, between Georgia Avenue and Sligo Creek Parkway, where the road operates with four lanes in the peak direction and two lanes in the off-peak direction, the plan recommends converting one of the peak direction lanes to a dedicated transit lane. The US 29 BRT transitway is recommended to operate in traffic on Lockwood Drive and Stewart Lane.

The project includes BRT stations at nine of the locations identified in the Countywide Transit Corridors Functional Master Plan but does not include the recommended stations at the US 29 / Fairland Road interchange or at US 29 / Franklin Avenue due to low anticipated demand. The project includes two additional stations not contemplated in the master plan on Castle Boulevard and Stewart Lane. Both stations are in low income areas of the county and therefore improve access for low-income residents.

The master plan recognizes that implementation of many of the recommendations in the plan is likely to be incremental. Page 15 states that: “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.” Therefore, while the US 29 BRT project does not fully implement the recommendations in the Countywide Transit Corridors Functional Master Plan, it is substantially consistent with the recommendations in the plan. Furthermore, the US 29 Mobility and Reliability Study will consider further enhancements to the operational efficiency of the corridor, including dedicated transit lanes south of Lockwood Road.

Project Benefits, Impacts and Costs

The benefits of the US 29 BRT project are substantial. In 2020, there are anticipated to be 13,000 daily boardings, of which about 4,000 boardings would be new transit riders and about 9,000 boardings would be existing bus riders who would benefit from higher quality transit service. In 2040, there are anticipated to be 20,000 daily boardings, of which 5,700 would be new transit riders and 14,300 would be existing bus riders who would benefit from higher quality transit service.

The project would result in substantial travel time savings for BRT buses compared to local buses:

- Burtonsville Park-and-Ride to Silver Spring: 26% faster
- Briggs Chaney Park-and-Ride to Silver Spring: 22% faster
- White Oak to Silver Spring: 35% faster

The cost to construct this project is \$31.5 million.

Pedestrian and Bicycle 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. We appreciate the pedestrian and bicycle access improvements included in this project and note that the US 29 Mobility and Reliability Study and other efforts will explore additional access improvements.

The US 29 BRT project proposes several bicycle and pedestrian station access improvements, including new sidewalks and curb ramps, new bikeways and bikeshare stations and improved crossings at intersections. In addition, pedestrian-scale lighting enhancements are proposed at most stations. Perhaps the most beneficial improvement is the proposed addition of a traffic signal at the intersection of US 29 and Lanark Way. This signal would not only improve connections to the bus rapid transit stations but would also improve access to Blair High School. Table 1 summarizes the planned access improvements at each BRT station.

Table 1: Planned Access Improvements by Station

Station	Sidewalk / Curb Ramps	Bikeway	Bikeshare Station ¹	Crossings
Silver Spring Transit Center			Existing	
Fenton Street			Existing	
Four Corners	ADA ramps			Proposed signal at Lanark Way ²
Burnt Mills			Northbound side	
Oak Leaf Drive	ADA ramps	200' shared use path	Southbound side	New striped crosswalks at Northwest Drive, Arrington Drive, and Oak Leaf Drive
White Oak Transit Center	ADA ramps		Northbound side	New striped crossing of Lockwood Drive
Stewart Lane	ADA ramps	350' sidewalk, 300' separated bike lanes	Southbound side	New striped crosswalks and median refuge at Stewart Lane
Tech Road	ADA ramps	200' sidewalk		Addition of curb to median crossing of US 29
Castle Boulevard	ADA ramps	350' shared use path	Yes	
Briggs Chaney Park-and-Ride	ADA ramps	325' sidewalk	Yes	
Burtonsville Park-and-Ride				

In general, pedestrian connections are good at most of the planned stations, and planned

¹ To create a network of bikeshare stations, additional docks are planned to be located at Castle Boulevard near the Briggs Chaney Marketplace, Stewart Lane near Old Columbia Pike, Lockwood Drive near the Enclave and the White Oak Recreational Center.

² MCDOT conducted a signal warrant study for the intersection of US 29 and Lanark Way and found that a full signal is warranted. MCDOT has submitted the warrant analysis and traffic control device design request to SHA District 3 for review. It is currently being reviewed.

improvements, as well as the potential for redevelopment at several stations, will further improve pedestrian connectivity. In contrast, bicycle connections to the BRT stations, as in most of the county, are limited and disconnected. Table 2 includes a review and evaluation of the pedestrian accommodations around each station. Of the 11 stations, staff's assessment is that three need additional improvements. The Four Corners and Burnt Mills stations need improvement due to the lack of a buffer between the sidewalk and US 29, which has a 40-mph posted speed limit. The Burtonsville Park-and-Ride Station needs improvement because there is no sidewalk connection between the station and the Burtonsville Town Center. Pedestrian improvements at these stations will likely require a mix of capital projects and redevelopment.

Table 2: Pedestrian Access by Station

Station	Posted Speed Limit	Buffer from Traffic?	Sidewalks	Walking Access
Silver Spring Transit Center	30 mph (US 29) 30 mph (Wayne Ave)	Yes	Yes	Good
Fenton Street	35 mph (US 29)	Yes	Yes	Good
Four Corners	40 mph (US 29)	Some	Yes	Needs Improvement
Burnt Mills	40 mph (US 29)	Some	Yes	Needs Improvement
Oak Leaf Drive	30 mph (Lockwood Dr)	Yes	Missing sidewalk on one side of Lockwood Dr	Adequate
White Oak Transit Center	30 mph (Lockwood Dr)	Some	Yes	Good
Stewart Lane	30 mph (Stewart Ln)	Some	Yes	Good
Tech Road	50 mph (US 29)	Yes	Yes	Adequate
Castle Boulevard	30 mph (Castle Blvd)	Yes	Yes	Good
Briggs Chaney Park-and-Ride	25 mph (Gateshead Manor Way)	Yes	Yes	Good
Burtonsville Park-and-Ride	25 mph (National Dr)	Yes	No sidewalk on National Dr	Needs Improvement

STAFF COMMENTS

Transportation

To improve walking and bicycling access to the stations we recommend adding four bicycle and pedestrian projects to the capital budget:

- Burtonsville Park-and-Ride: National Drive provides a direct connection between the Burtonsville Park-and-Ride station to Burtonsville Town Center but currently lacks sidewalks. Since this road is on private property, MCDOT should work with the property owner to add a sidewalk along National Drive.



View of National Drive looking east

- Castle Boulevard Station: There is limited bicycle access on Castle Boulevard. Therefore, construct one-way separated bike lanes between Briggs Chaney Road and Castle Ridge Circle. This is a four-lane road that has been reduced to two lanes with traffic calming and there is sufficient space to accommodate a bikeway along most of the alignment.



View of Castle Boulevard looking north

- Burnt Mills Station: There is limited bicycle access along US 29 to the Burnt Mills Station. Therefore, consider upgrading the sidewalk to a shared use path on the east side of US 29 between Lockwood Drive and the southern entrance to the Burnt Mills Shopping Center (aka Tom's Drive) where right-of-way is available. This will also improve access to the Burnt Mills Shopping Center.



View of US 29 looking north at Burnt Mills

- Oak Leaf Drive Station: There is limited pedestrian and bicycle access along Lockwood Drive to the Oak Leaf Drive Station. Therefore, complete the shared use path on Lockwood Drive from US 29 to Northwest Drive. This will also improve access to the White Oak Shopping Center and to the Burnt Mills Shopping Center.



View of Lockwood Drive looking north

In addition, staff has several station-specific comments:

General

- Upgrade the proposed bike rack at each station with weather-protected shelters.

Fenton Street Station

- At the southbound platform, construction of the Fenton Street Station and associated paving, signage and any railings or other alterations will require a Historic Area Work Permit (HAWP) and approval by the Historic Preservation Commission (HPC).
- At the northbound platform, the platform is elevated above sidewalk level, but there is no railing to alert waiting passengers to the drop-off. Consider whether ADA accessible warning devices or barriers are needed on the south side of the station platform for the benefit of people with vision or mobility challenges.

Four Corners Station

- At the northbound platform, align the ramps to maintain a 10-foot-wide clear space for the planned shared use path.

Oak Leaf Drive Station

- At the southbound platform, show the existing sidewalk connecting Lockwood Drive to the proposed bikeshare station and widen the sidewalk to 5 feet adjacent to the bikeshare dock to enable users to pull bikes from the dock.
- At the southbound platform, consider working with the property owners to straighten out and widen the sidewalk section between the Oak Leaf Drive station and Oak Leaf Drive.
- At the southbound platform, the existing sidewalk on the south side of Lockwood Drive should be shown on the plans.

Stewart Lane

- Show how the proposed curb ramps connect to existing sidewalks.
- Consider the use of green paint to denote conflicts areas on the pavement for the separated bike lanes proposed at the Stewart Lane station.

Tech Road Station

- Provide a 10-foot-wide pedestrian refuge in the median with protection from traffic (aka a bull nose).
- At the northbound platform, the buffer between the sidewalk and US 29 should be at least 5 feet wide.
- At the northbound platform, provide a more gradual transition between the curb ramp and the sidewalk to the Tech Road Station.
- At the northbound platform, on the north side of Tech Road between US 29 and Prosperity Drive, shift the sidewalk to the north behind the existing utility pole to create a buffer from traffic.

Castle Boulevard Station

- No bike racks are shown on the station plans. Therefore, provide weather-protected bike racks directly adjacent to the platform.

Briggs Chaney Park-and-Ride Station

- No bike racks are shown on the station plans. Therefore, provide weather-protected bike racks directly adjacent to the platform.

Burtonsville Park-and-Ride Station

- Per zoning regulations, one-way drive aisles adjacent to parking spaces oriented at 60-75 degrees must be 18 feet wide, not 17 feet wide as shown. Please revise the parking angle or increase the width of the one-way drive aisle.

- Per zoning regulations, the current parking spaces as dimensioned (60-degree angle, 8.5 feet wide, 21 feet in length) can only be used for compact cars. Please label the parking accordingly or update the dimensions for standard vehicles per the zoning code.

Historic Preservation

The Fenton Street station consists of two platforms located near the intersection of Fenton Street and US 29. One platform measuring approximately 20' by 10' is located on the southern side of US 29, near the southeast corner of the US 29 / Fenton Street intersection. A second platform measuring approximately 65' x 16.2' is located on the northern side of US 29, near the northwest corner of the US29 / Fenton Street intersection.

The first platform on the south side of US 29 is located within the Silver Spring CBD Locational Atlas Historic District (#36/7), shown in Figure 2 below. Under Section 24A-10 of the Historic Preservation Ordinance, projects located within Locational Atlas Historic Districts must be evaluated to determine if the proposal constitutes either a demolition or a substantial alteration. This platform is being constructed in an area that is already paved and is already used to support mass transit with a bus stop adjacent and near the Fenton Street intersection. The addition of the railing and the change in the paving to support the construction of this platform is not a substantial alteration to the Silver Spring CBD Locational Atlas Historic District and requires no further historic preservation review.

The second platform, located on the northern side of US 29 is located fully within the Silver Spring CBD, but also partially within the boundaries of the Montgomery Arms Apartments Master Plan Historic Site (#36/007-002A). The parcel boundary of Montgomery Arms extends into the sidewalk in this area by approximately 10 feet; more than half of this platform is technically located within the parcel boundary of Montgomery Arms and will require a permanent easement to be constructed. The easement area is noted on the submitted plans and cross-section for this platform. Construction of this platform and associated paving, signage and any railings or other alterations will require a Historic Area Work Permit (HAWP) and approval by the Historic Preservation Commission (HPC). No alterations are currently proposed to the retaining wall, steps or landscaped area of the Montgomery Arms Apartments.

While this platform will technically be located inside the boundaries of the Historic Site, the area is already paved and is a heavily used sidewalk. The construction of the BRT platform itself will not substantially change the character of this location. The HPC will evaluate whether the construction of any signage, railings or appurtenances associated with this platform meet the standards of approval set forth in Section 24A-8 of the Historic Preservation Ordinance.

Figure 2: Location of Historic Sites and Districts. Montgomery Arms Apartments shown in red circle.

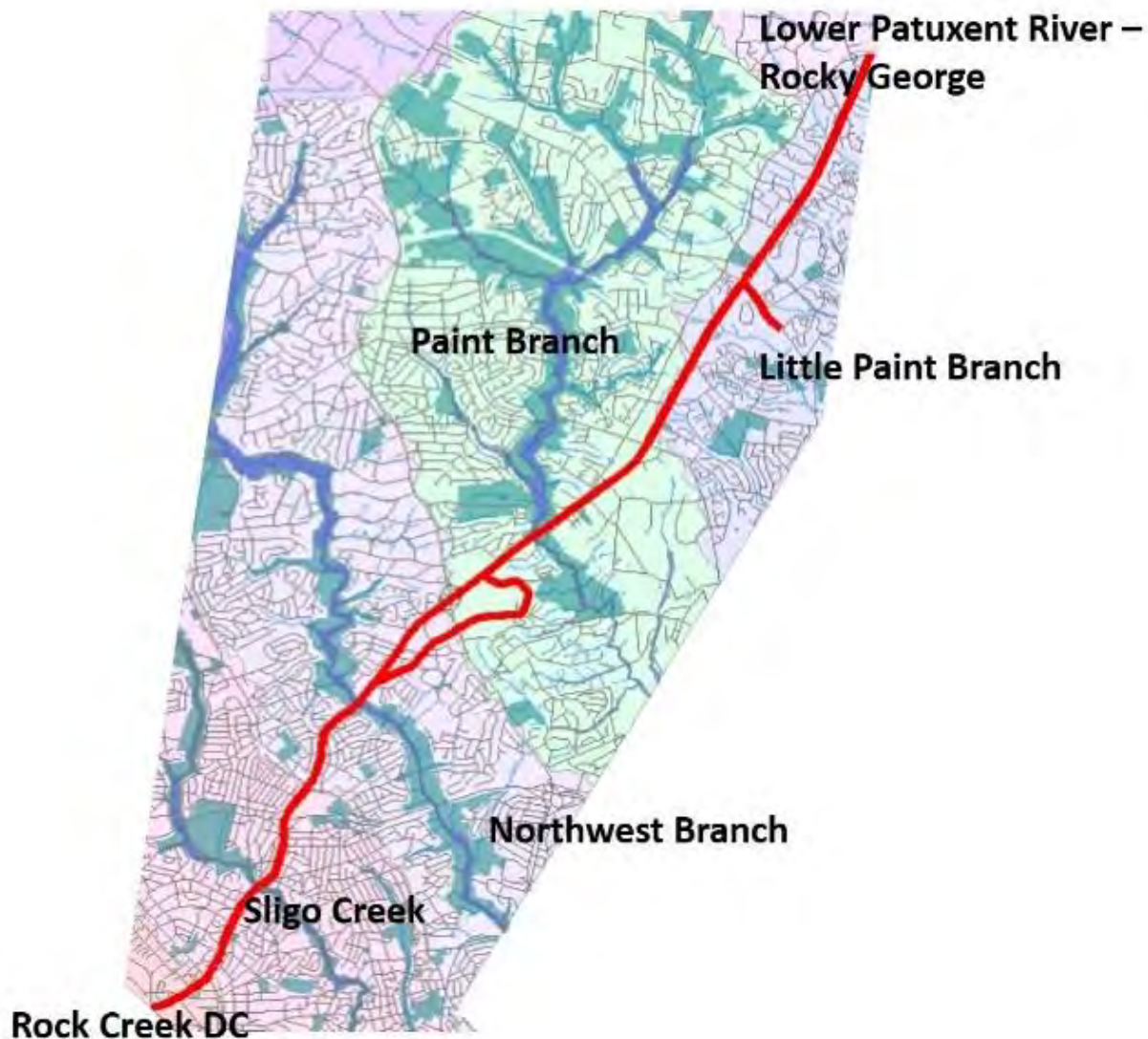


Environmental Analysis

Environmental Guidelines

The US 29 Bus Rapid Transit (BRT) plan crosses six subwatersheds. From south to north, those subwatersheds are Rock Creek DC (Use I), Sligo Creek (Use I), Northwest Branch (Use IV), Paint Branch (Use III), Little Paint Branch (Use I), and Lower Patuxent River - Rocky Gorge (Use I-P). While the plan crosses three streams and their associated stream valley buffers and floodplains - Sligo Creek, Northwest Branch, and Paint Branch, no additional disturbance is proposed in the stream valley buffer or floodplain. Figure 3 shows the six subwatersheds

Figure 3: Subwatersheds



Forest Conservation

The proposed project is subject to the Montgomery County Forest Conservation Law (Chapter 22A of the County Code) but has received an exemption (42018245E) from Article II that require the preparation of a forest conservation plan under Section 22A-5(e). The site is a State or County highway construction activity that is subject to Section 5-103 of the Natural Resources Article of the Maryland Code or Section 22A-9 of the Forest Conservation Law for County Highway Projects, which states;

- a) General
 - 1. This section applies to construction of a highway by the County as part of an approved Capital Improvements Program project.
 - 2. The construction should minimize forest cutting or clearing and loss of specimen or champion trees to the extent possible while balancing other design, construction, and environmental standards. The constructing agency must make a

reasonable effort to minimize the cutting or clearing of trees and other woody plants.

- b) If the forest to be cut or cleared for a County highway project equals or exceeds 20,000 square feet, the constructing agency must reforest a suitable area at the rate of one acre of reforestation for each acre of forest cleared.
- c) Reforestation for County highway projects must meet the standards in subsections 22A-12(e), (g) and (h).
- d) Any mitigation requirement for loss of specimen or champion trees must be based on the size and character of the tree.

This plan does not propose to remove over 20,000 square feet of forest and is not subject to reforestation requirements under 22A-9. See Attachment D for the forest conservation exemption.

Proposed Project

The US 29 BRT project will primarily be located within the existing right-of-way (ROW). However, the project's limit of disturbance (LOD) does extend beyond the existing ROW due to the platforms and associated stormwater management. MCDOT has submitted a Tree Save Plan with the Mandatory Referral, showing the impacts of the proposed disturbance on trees and the proposed protection measures. While no forest is impacted by this disturbance, 75 trees with less than 24-inch diameter at breast height (DBH), two trees greater than or equal to 24 inches DBH and less than 30 inches DBH, and one tree greater than or equal 30 inches DBH will need to be removed. The project will include installation of landscaping adjacent to proposed platforms and stormwater management facilities, including planting of replacement street trees within the corridor where feasible. Unfortunately, there is little available room to replace these trees, as the entire disturbed area will be used for construction of BRT station areas and associated stormwater management facilities. The majority of the trees impacted are street trees.

Parks

This project does not impact park resources.

PUBLIC OUTREACH

MCDOT has conducted numerous events and public meetings over the past year in support of this project. Engagement opportunities included community open houses, an online survey and feedback form, attendance at neighborhood festivals, community events, and transit centers and presentations at community and business association meetings. Open houses and opportunities for online engagement were promoted through mailings and online advertisements on both traditional media and social media sites.

Citizens Advisory Committee Meetings:

- A total of 38 individual Corridor Advisory Committee (CAC) meetings have been held since September 2015.

Open Houses:

- April 4, 2018: White Oak Community Center
- April 3, 2018: Montgomery Blair High School
- March 15, 2018: Downtown Silver Spring
- November 20, 2017: Silver Spring Civic Center
- November 16, 2017: Montgomery Blair High School
- November 15, 2017: East County Regional Service Center
- March 15, 2017: White Oak Community Center
- March 13, 2017: Montgomery Blair High School
- March 7, 2017: Silver Spring Civic Center

CONCLUSION

Staff strongly supports the US 29 Bus Rapid Transit project, which will provide substantial benefits to existing and new transit riders along the US 29 corridor for a modest cost. This project is an important step toward the creation of Montgomery County's planned bus rapid transit network.

Staff would also like to commend MCDOT staff and their consultant team on the extensive inter-agency collaboration they have maintained with this project. The project team has conducted numerous meetings with Planning staff over the past year and have been highly responsive to our comments.







ATTACHMENTS

- Attachment A: Maps of Planned Transit Station Locations
- Attachment B: Planning Board Letter to Director Roshdieh 02-22-2017
- Attachment C: Excerpts from 2013 Countywide Transit Corridors Functional Master Plan
- Attachment D: Forest Conservation Exemption

**Attachment C: Staff Report for Draft US 29 Bus Rapid Transit Corridor
Study (February 2017)**



US 29 Bus Rapid Transit (BRT) Corridor Planning Study Briefing

-  Tom Autrey, Supervisor, thomas.autrey@montgomeryplanning.org, 301-495-4533
 -  Stephen Aldrich, Master Planner, stephen.aldrich@montgomeryplanning.org, 301-495-4528
 -  David Anspacher, Planner Coordinator, david.anspacher@montgomeryplanning.org, 301-495-2191
 -  Pam Dunn, Chief - Functional Planning and Policy, pamela.dunn@montgomeryplanning.org, 301-650-5649
 -  Charles Kines, Park & Trail Planner/Coordinator, charles.kines@montgomeryparks.org 301-495-2184
 -  Laura Hodgson, Planner Coordinator, Area 3, laura.hodgson@montgomeryplanning.org 301-495-4541
-

Summary

The Maryland Transit Administration (MTA), in coordination with the Maryland State Highway Administration (SHA) and the Montgomery County Department of Transportation (MCDOT) has recently completed a Draft Corridor Study Report that evaluates three different alternatives for providing BRT service between the Silver Spring Central Business District (CBD) and the Burtonsville Park and Ride Facility. The study of these alternatives – along with on-going similar planning studies for the MD 586 (Veirs Mill Road) and MD 355 (Rockville Pike / Wisconsin Avenue) corridors - are “next step” studies following the adoption of the Countywide Transit Corridors Functional Master Plan (CTCFMP) in December 2013. **This briefing will consist of three short presentations. The MTA will first present a summary of the Draft Corridor Study Report. Staff will follow with comments on the technical aspects of the Draft Corridor Study Report that are to be forwarded to the MTA, MCDOT, and the Washington Metropolitan Area Transit Authority (WMATA) after Planning Board review and approval. The briefing will close with a presentation by MCDOT on the County Executive’s 2020 Plan that is designed to have BRT operational in the corridor by 2020.**

Planning Board Action

This is primarily a briefing. The purpose is to provide the Planning Board with an opportunity to review the staff comments on the Draft Corridor Study Report and receive an update on the status of BRT planning in the US 29 corridor. The Planning Board will be asked to approve forwarding the staff comments with revisions as necessary. In addition, MTA and MCDOT staff will review the scope of the next phase of work related to the introduction of BRT in the corridor. **Emphasis will be placed on the recent decision by MTA and MCDOT that more analysis is required to reach a recommendation on how or whether to include managed lanes as part of the longer term and given that, there is no plan to recommend a Locally Preferred Alternative from among those analyzed in this Study for advancing into preliminary engineering (30% design). The near-term focus instead will be on advancing the County Executive’s 2020 Plan.** The staff comments are noted in bold throughout the document and presented in summary format at the end of the staff report. It is this set of comments that the staff is requesting the Planning Board approve for forwarding to the stakeholder agencies.

Draft Corridor Study Alternatives

The Study initially reviewed eight preliminary conceptual alternatives that varied with respect to design elements and roadway running way options for the BRT. Three conceptual “build” alternatives were retained for further study, along with a “No-Build” alternative.¹

No Build Alternative

The No Build Alternative assumed no improvements to infrastructure or bus service along US 29 beyond those improvements in the regional 2014 Constrained Long Range Plan (CLRP) for 2040. The CLRP includes the planned interchange at Musgrove/Fairland Road in 2025. Other than the Purple Line, there are no other major projects in the CLRP that are located within the US 29 corridor itself.

The Study notes that there are other projects planned but not currently programmed or funded that are identified in the White Oak Science Gateway (WOSG) Master Plan. These include (1) the BRT network, (2) the Old Columbia Pike Bridge opened to traffic, (3) the planned US 29 interchange at Tech Road / Industrial Parkway, (4) new local roads proposed in the Life Sciences / FDA Village Center, and (5) intersection geometric improvements.²

Alternative A

Alternative A includes the following treatments and assumptions regarding the BRT running-way:

- From Stewart Lane to MD 198 – Median Shoulder BRT lanes
- From the Silver Spring Transit Center (SSTC) to Stewart Lane - Intermittent peak period – peak direction curbside business access transit lanes (“BAT” lanes).

The BAT lanes would be created by re-purposing the peak direction curb lane to accommodate BRT buses, local buses, and right turning traffic. There would also be segments between the SSTC and Stewart Lane where the BRT buses would run in mixed traffic. The segments where the BRT buses would be in mixed traffic are (1) Stewart Lane and Lockwood Drive, (2) US 29 between University Boulevard and I-495, and (3) Colesville Road between Georgia Avenue and the SSTC.³

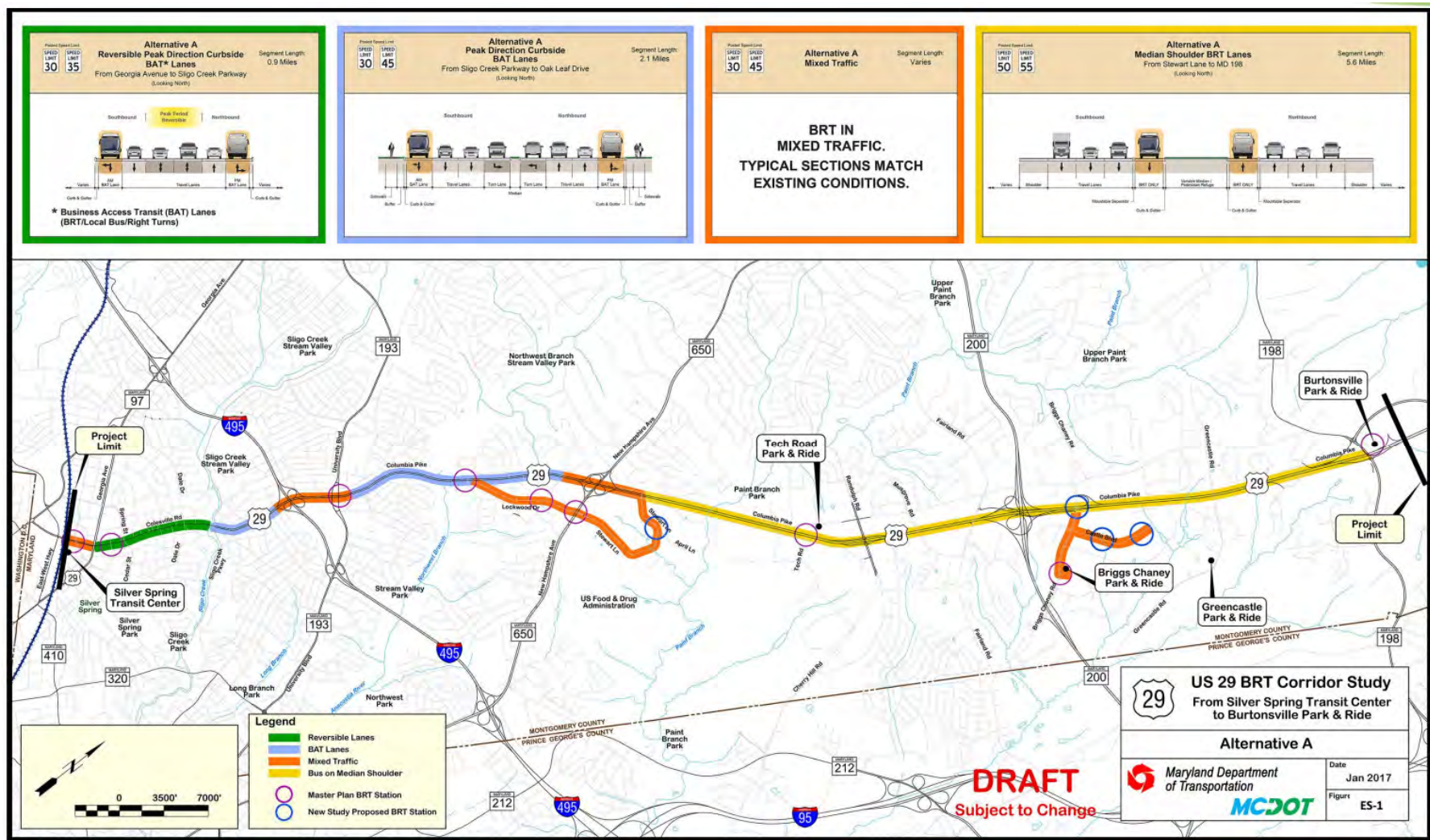
Figure 1 depicts the treatments assumed for Alternative A for the entire corridor.

¹ As noted in the Study, five alternatives were eliminated in part because of opposition (as expressed through the Citizens Advisory Committee) to alternatives that would require major right of way acquisition, create significant property impacts and/or could not be implemented in a relatively short time frame. See page 66 of the Draft Corridor Study Report.

² For an update on the status of advancing certain transportation improvements in White Oak see the County Council staff report of February 2, 2017 at http://montgomerycountymd.granicus.com/MetaViewer.php?view_id=136&event_id=5240&meta_id=131086

³ The Countywide Transit Corridors Functional Master Plan (CTCFMP) included a recommendation for operation in mixed traffic along Stewart Lane and Lockwood Drive and dedicated BRT lanes along the balance of the corridor. The Plan (pages 14 and 15) “*recommends the more efficient use of existing rights of way along (other) corridor segments by repurposing existing travel lanes where the value of doing so is confirmed through more detailed facility studies and operational planning. This Plan does not envision that full-time dedicate bus lanes will be implemented as a first step in most locations.*”

Figure 1 – Alternative A



Alternative B

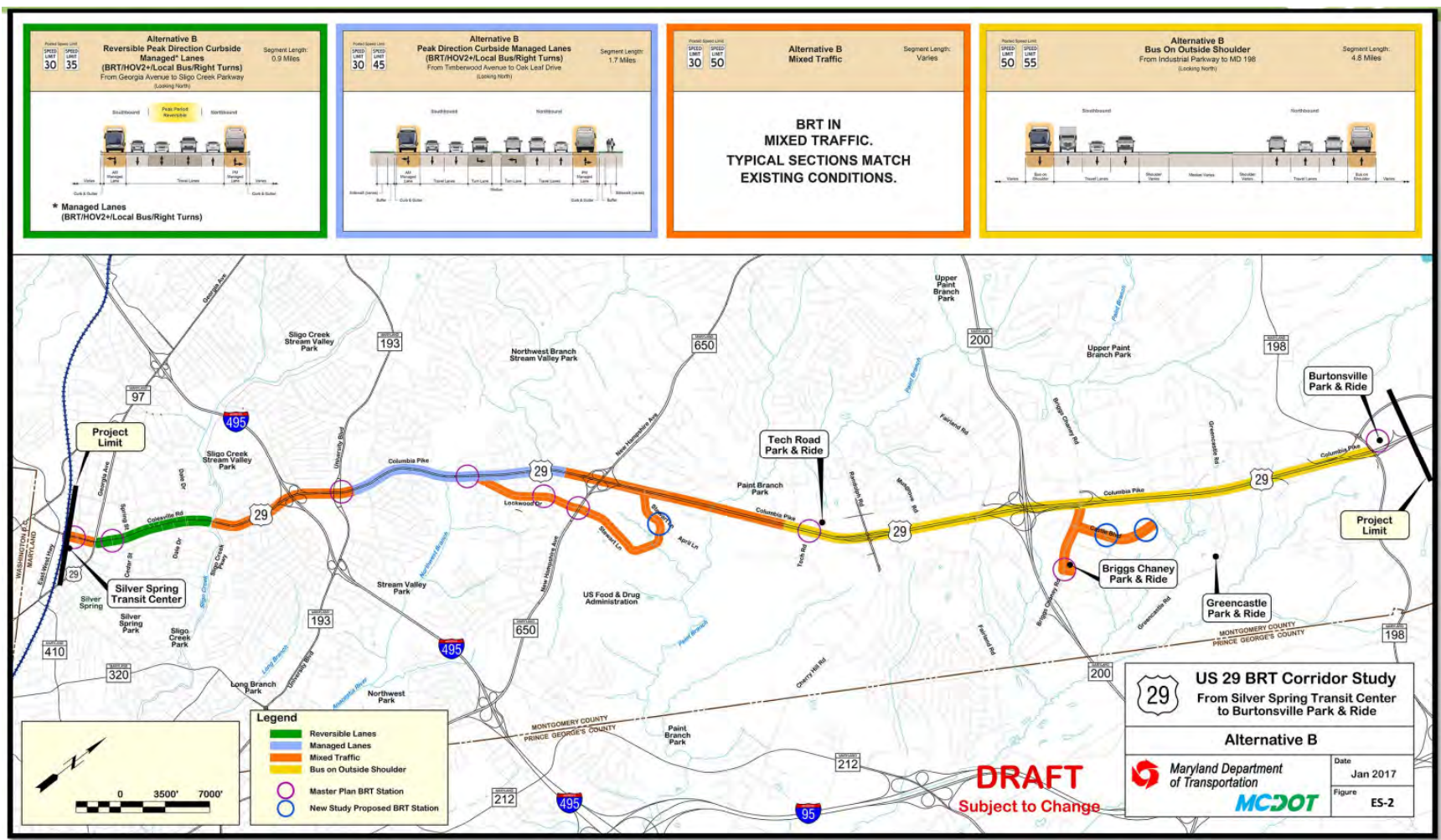
Alternative B includes the following treatments and assumptions regarding the BRT running-way:

- From Industrial Parkway to MD 198 – Peak period bus on outside shoulder lanes
- From Timberwood Avenue to Oak Leaf Drive – Peak direction curbside managed lanes for BRT, HOV+2, local bus, and right turning vehicles.
- From Georgia Avenue to Sligo Creek Parkway - reversible peak direction curbside managed lanes for BRT, HOV-2, local bus, and right turning vehicles.

BRT buses would operate in mixed traffic on US 29 from Industrial Parkway to Oak Leaf Drive, along Stewart Lane and Lockwood Drive, between University Boulevard and Sligo Creek Parkway and between Georgia Avenue and the SSTC.

Figure 2 depicts the treatments assumed for Alternative B for the entire corridor.

Figure 2 – Alternative B



Alternative B Modified

Alternative B Modified assumes the similar treatment (Median shoulder BRT lanes) as Alternative A for the segment between Stewart Lane and MD 198 and the similar treatment(s) as Alternative B for the segment between the SSTC and Stewart Lane. The one exception is that the peak direction curbside managed lanes for BRT, HOV+2, local bus, and right turning vehicles extend from Sligo Creek Parkway to Oak Leaf Drive.

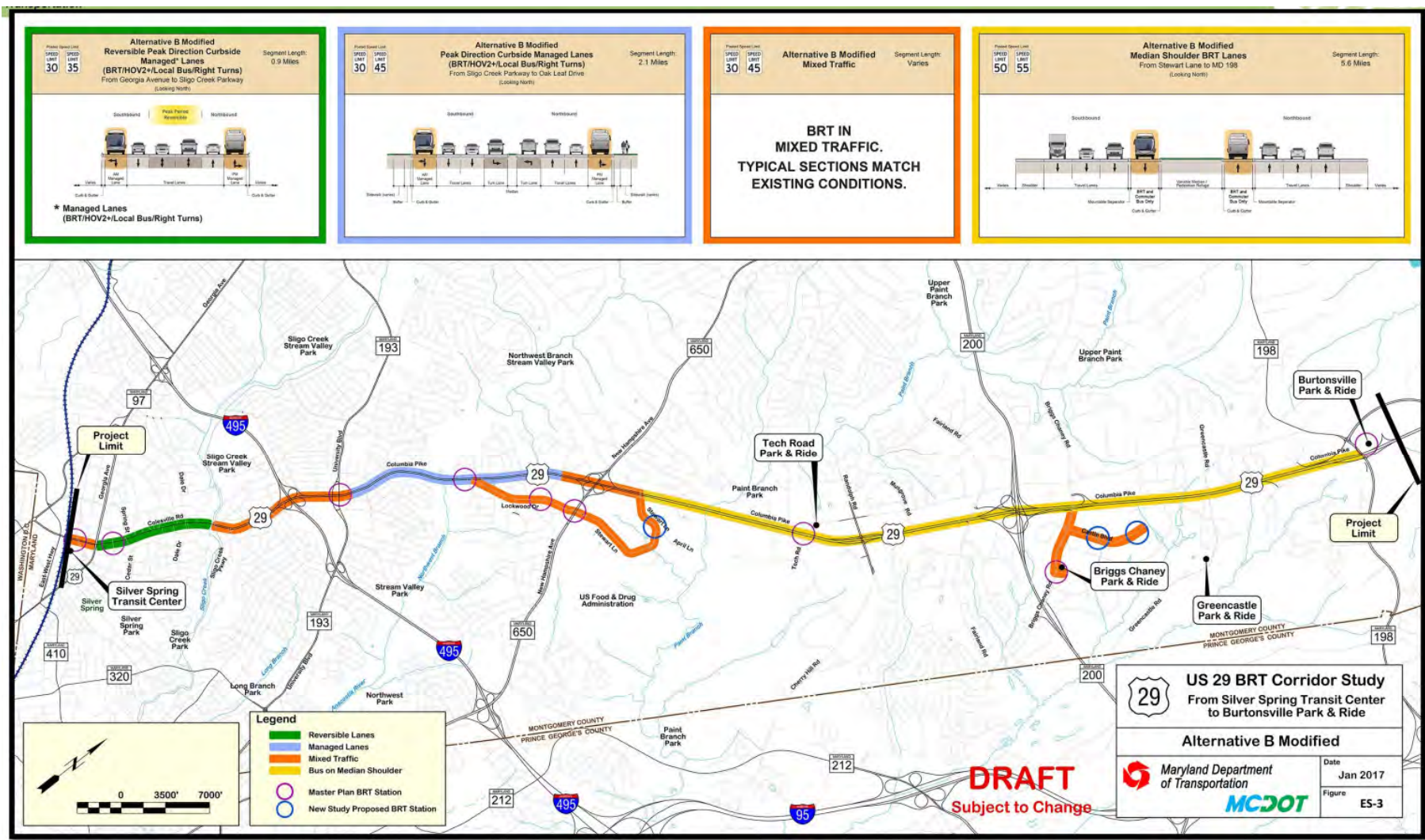
Figure 3 depicts the treatments assumed for Alternative B Modified for the entire corridor.⁴

Transition from Median to Curb Lane Operation

Alternative A and Alternative B Modified transition from the buses using center lanes in the north to outside or shoulder lanes in the south. Staff is concerned this transition will further slowdown buses in heavy traffic. Therefore, it may be helpful to describe this transition and what can be done to assist in the large merge required mid-way through the route.

⁴ The section title and corridor depiction of peak direction curbside managed lanes (i.e., the blue segment) appear to be inconsistent with respect to where the treatment ends on the south end of the corridor.

Figure 3 – Alternative B Modified



Station Locations

The Study included some modifications to the recommended station locations in the CTCFMP after coordination with staff, WMATA, MCDOT, and the US 29 Citizens Advisory Committee.

Draft US 29 BRT Station Locations	CTCFMP Recommended Station Locations
Silver Spring Transit Center	Silver Spring Transit Center
US 29 at Fenton Street / Spring Street	US 29 and Fenton Street
	US 29 and Franklin Avenue
US 29 at University Boulevard	US 29 and University Boulevard
US 29 at Burnt Mills Shopping Center (just south of Hillwood Drive)	US 29 and Hillwood Drive
Lockwood Drive at Oak Leaf Drive	Lockwood Drive and Oak Leaf Drive
White Oak Transit Center	White Oak Transit Center
US 29 at Tech Road	US 29 and Tech Road
	US 29 and Fairland Road
US 29 at Briggs Chaney Road (Alternative A Only)	
Castle Ridge Way at Castle Boulevard	
Castle Terrace at Castle Boulevard	
Briggs Chaney Park and Ride	Briggs Chaney Park and Ride
Burtonsville Park and Ride	Burtonsville Park and Ride

No BRT Station is planned at the intersection of US Route 29 and Fairland Road as called for in the Countywide Transit Corridors Functional Master Plan (CTCRMP). The Study should include an explanation of why this station was removed.

Comparison of Alternatives

A summary of the key travel related findings of the evaluation of the alternatives as listed in the Study is provided below:

- The forecast 2040 BRT daily boardings range from 16,400 to 18,120 with Alternative A the highest.
- The forecast for all transit daily boardings range from 33,700 to 34,900 – an increase of 18 to 22 percent over the “No-Build” 2040 estimate. Currently, there are about 11,000 transit daily boardings.⁵
- Auto vehicle miles of travel (VMT) is reduced under all three alternatives when compared to the No-Build.
- Transit person miles traveled (PMT) is increased under all three alternatives when compared to the No-Build.
- Peak period person throughput improves somewhat under each of the alternatives when compared to the No-Build. The exception is the segment south of Fenton Street northbound in the evening.
- Transit travel times improve with BRT passengers saving as much as 20 minutes compared to the No-Build local buses.
- The forecast number of miles of roadway operating in the PM peak hour at Level of Service (LOS) E or F shows a decrease from 5.4 miles for the No-Build to 2.1 (Alternative A) to 3.7 (Alternative B) miles under the alternatives. The AM however shows an increase from 7.3 miles under the No-Build to up to 8.9 miles (Alternative B modified) under the alternatives.

A closer look at the peak period person throughput summary as provided in the report is shown below:

	No Build		Alt A				Alt B				Alt B Modified			
	AM	PM	AM	PM	% Change AM	% Change PM	AM	PM	% Change AM	% Change PM	AM	PM	% Change AM	% Change PM
Northbound														
South of Fenton Street	1,390	3,260	1,560	2,320	12%	-29%	1,580	2,490	14%	-24%	1,590	2,750	14%	-16%
North of Franklin Avenue	2,090	4,770	2,450	4,470	17%	-6%	2,370	4,670	13%	-2%	2,390	4,700	14%	-1%
South of Burnt Mills SC	3,140	5,300	3,450	5,100	10%	-4%	3,430	5,540	9%	5%	3,440	5,590	10%	5%
On Lockwood Drive	500	940	640	1,290	28%	37%	630	1,250	26%	33%	630	1,250	26%	33%
North of Stewart Lane	3,080	4,000	3,290	4,490	7%	12%	3,310	4,460	7%	12%	3,310	4,590	7%	15%
North of Greencastle Road	3,060	3,940	3,070	4,200	0%	7%	3,070	4,170	0%	6%	3,090	4,230	1%	7%
Southbound														
North of Greencastle Road	4,410	3,410	4,720	3,420	7%	0%	4,660	3,420	6%	0%	4,740	3,430	7%	1%
North of Stewart Lane	3,270	3,260	3,310	3,550	1%	9%	3,590	3,510	10%	8%	3,610	3,560	10%	9%
On Lockwood Drive	340	500	790	650	132%	30%	780	640	129%	28%	790	540	132%	8%
South of Burnt Mills SC	4,450	3,390	4,480	3,670	1%	8%	4,950	3,630	11%	7%	4,950	3,610	11%	6%
North of Franklin Avenue	4,480	2,580	4,410	2,720	-2%	5%	4,980	2,670	11%	3%	5,010	2,690	12%	4%
South of Fenton Street	3,730	1,790	3,990	1,950	7%	9%	4,150	2,010	11%	12%	4,230	1,990	13%	11%

As shown above, the travel forecast reflects increased throughput for all three build alternatives along most segments in the corridor.⁶

⁵ Montgomery County US 29 BRT FY 2016 TIGER Grant Application

⁶ The fourth bullet on page 7 of the Study related to this appears to be incorrect (i.e., the reference to 940 people).

The Study also includes a range for capital and operating costs for each alternative as well as ranges for certain environmental impacts as noted in the table below.

Evaluation Criteria		No-Build Alternative	Alternative A	Alternative B	Alternative B Modified
COSTS ¹	Right-of-way (ROW)	\$0	\$1.5M-\$3M	\$2M-\$4.5M	\$1.5M-\$3M
	Construction	\$0	\$80M - \$112.4M	\$60M-\$107.9M	\$77M-\$105.6M
	Vehicles	\$0	\$21M	\$17M	\$19M
	Total Capital Cost	\$0	\$102.5M-\$136.4M	\$79M-\$129.4M	\$97.5M-\$127.6M
	Annual Operating Cost	\$0	\$8.8M-\$9.8M	\$7.6M-\$8.6M	\$8.5M-\$9.5M
ENVIRONMENTAL IMPACTS	Socioeconomic				
	Total ROW Required (acres)	0	2-4	3-6	2-4
	Properties Impacted (number)	0	5-20	20-30	5-20
	Residential Relocations (number)	0	0	0	0
	Business Displacements (number)	0	0	0	0
	Public Parks Affected (number)	0	1	1	1
	Public Park Property Required (acres)	0	0-0.2	0-0.2	0-0.2
	Total Number of Public/Community Facilities Permanently Impacted	0	1	2	2
	Cultural Resources				
	Historic Properties (acre)	0	0-0.1	0-0.1	0-0.1
	Natural Resources				
	Stream Impact (linear feet)	0	0-20	0-125	0-20
	100-Year Floodplain (acres)	0	0-0.5	0-1	0-0.5
	Wetlands (acres)	0	0-0.2	0-0.2	0-0.2
	Forests (acres)	0	1-3	2-5	1-3
	Federally or State Listed RTE Species (number)	0	0	0	0

1. Costs presented in 2016 dollars and as ranges developed using SHA estimating guidelines to account for currently unknown design and construction needs.

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

- Sligo Creek Stream Valley Park (Units 2 and 3)
- Northwest Branch Stream Valley Park (Unit 4)
- Paint Branch Stream Valley Park (Unit 4)

There are an additional eight Commission properties in the study area:

- Gene Lynch Urban Park
- Ellsworth Urban Park
- Hastings Neighborhood Conservation Area
- Burnt Mills West Special Park
- Martin Luther King Jr. Recreational Park
- Stonehedge Local Park
- Calverton Neighborhood Conservation Area
- Stonecrest Neighborhood Conservation Area

In addition, one existing hard surface park trail and two natural surface park trails (one existing, one proposed) cross U.S. 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
- Northwest Branch
- Paint Branch

All alternatives appear to impact at least one of the above parks, and all will have impacts to the streams. At the time of more detailed design for the selected alternative, Montgomery Parks will provide detailed comments, including opportunities to improve stormwater discharge into streams on parkland. Montgomery Parks staff should be included in any interagency coordination meetings regarding more detailed design of the selected alternative. In addition, any work on parkland will require a park permit.

The Study notes that the potential exists for sidewalk uses and/or park entrances to be altered depending on final design and bus stop locations. The number of public parks impacted ranges from zero to two and the estimated acreage impacted ranges from zero to 0.2 acres.

The estimated linear feet of streams impacted range from zero to 125. The estimated wetland impacts range from zero to less than 0.2 acre. The estimated forest impacts range from 1.0 acres to 5.0 acres.

The several cultural resources were identified within the study area (architectural and archaeological resources (Table 5-2), page 93-96). Of these, four (Polychrome Historic District, Robert B. Morse Water Filtration Plant, Silver Theater and Silver Spring Shopping Center, and Montgomery Arms) are County designated sites or districts listed in the Master Plan for Historic Preservation and two (Old Silver Spring Commercial Area and the J.C. Penney Co Building) are identified in the Locational Atlas. These resources are protected under Chapter 24A of the County Code. The study included no analysis of the potential impact to cultural resources, but acknowledges that future studies will need to assess the project's impact on identified cultural resources consistent with Section 4(f) of the US Department of Transportation Act of 1966, Section 106 of the National Historic Preservation Act and the Maryland Historical Trust Act of 1985 (as amended).

None of the conceptual build alternatives are estimated to have disproportionately high adverse impact on minority or low-income populations.

The estimated number of properties impacted by the conceptual build alternatives ranges from five to 30. There are no property displacements or relocations anticipated.

Decision to Not Advance into Environmental Analysis / Preliminary Engineering Phase

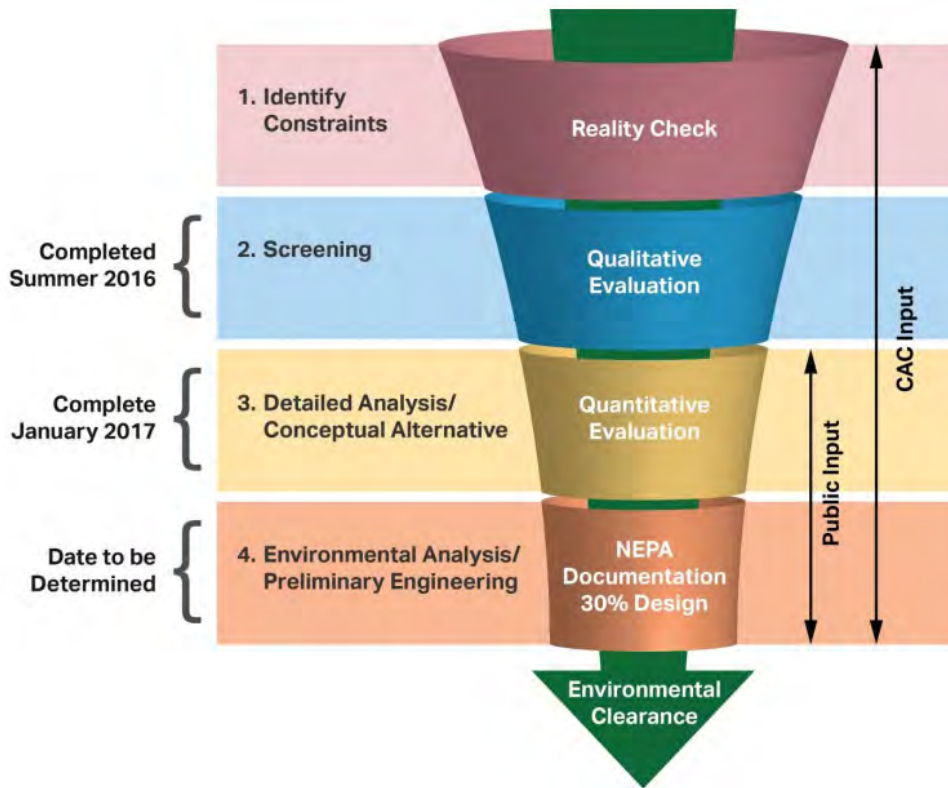
Last month, the Study team notified the US 29 Advisory Committee of the following change in the evaluation process:

“One notable finding of the Corridor Study Report (CSR) is that implementation of managed lanes requires additional analysis. As a result, managed lanes will not be included as part of the County’s BRT project on US 29. The US 29 BRT will use existing Bus on Shoulder north of Tech Road and existing travel lanes south of Tech Road. The project will include BRT stations, new vehicles, Transit Signal Priority (TSP), and station-area bike/pedestrian improvements. MCDOT will continue to work with MDOT to implement improvements within State right of way.

Completion of the CSR, which focuses on a 2040 horizon year, is a significant milestone and represents a point of transition from long range planning into design of more immediate transit improvements for the US 29 corridor. The more immediate BRT implementation is based on the County Executive’s vision described last March for implementation using existing infrastructure as much as possible by 2020.”

The Study includes the following process flow chart depicting the fourth step as now occurring on a date to be determined. Typically, at this point in the process, a Locally Preferred Alternative would be recommended to advance into the fourth step.⁷ In this case, the Study team has concluded that it cannot recommend an alternative because the implementation of managed lanes requires additional analysis. Managed lanes as defined in the Study are an element of both Alternative B and Alternative B Modified. Managed lanes are not an element of Alternative A. The Study (page 56) notes the slight difference between Managed Lanes and BAT lanes being that non-bus HOVs are restricted from the BAT lanes and must remain in the general-purpose traffic lanes.

⁷ The Planning Board may choose however to recommend an alternative with the understanding that MTA will not be advancing any alternative into Step 4 in the above flow chart. **If the Board chooses to recommend an alternative now, staff would recommend Alternative A as Alternatives B and B Modified include the managed lane segments (with HOV-2) that require additional analysis and are generally used more on limited access facilities (see discussion below).**



If MDOT is not advancing any of the three alternatives in the US 29 BRT Corridor Study Report (CSR), it is important for the CSR to note the improvements that are being implemented as part of the County Executive’s 2020 BRT Plan.⁸

The Study also does not include narrative on why managed lanes require additional analysis or why the additional analysis cannot be conducted now to better evaluate the alternatives before moving into the fourth step as shown in the chart above. This information should be included in the Final Study Report.

If MDOT is not advancing any of the alternatives in the US 29 BRT Corridor Study Report (CSR), the CSR should note when MDOT intends to finish the remaining study needed (managed lanes), choose a preferred alternative, and move forward with advancing the preferred alternative as originally planned.

Managed Lanes vs. BAT Lanes

The Study notes that the Managed Lane and BAT Lane segments of the respective alternatives are typically repurposed from existing general purpose travel lanes – something the CTCFMP encourages where feasible. Managed Lanes as defined in Alternatives B and B modified in the Study include HOV-2 as part of the operating assumption in the southern segment of the corridor. More often, designating a lane for both BRT and HOV-2

⁸ The CSR, for example, does not note that the current plans are to use existing Bus on Shoulder north of Tech Road and existing travel lanes south of Tech Road or that the project will include BRT stations, new vehicles, Transit Signal Priority (TSP), and station-area bike/pedestrian improvements.

use is an application reserved for limited access facilities like freeways or expressways.⁹ **The Final Study Report should provide background on the decision to include HOV-2 as part of two of the build alternatives in the southern segment of the corridor to inform the follow-up analysis that is to take place at some undetermined time in the future.**

Incremental Introduction of Priority Treatments vs. Functional Plan Vision

MCDOT will brief the Planning Board on the County Executive's US 29 BRT 2020 Plan. As noted above the Plan includes BRT stations, new vehicles, Transit Signal Priority (TSP), and station-area bike/pedestrian improvements and is intended to have select major components of BRT operating in the corridor in the near term with relatively little impact on adjacent property and at a lower cost than would otherwise be the case. Funds to complete final design and begin construction in FY 19 have been included in the County Executive's recommended FY 18 amendments to the FY 17 – FY 22 Capital Improvements Program.

The incremental introduction of BRT is consistent with the CTCFMP which notes the following:

"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."

This approach introduces BRT elements of in a corridor with right of way constraints along certain segments. This is an approach that will likely be repeated in various segments of each corridor identified in the Countywide Transit Corridors Functional Master Plan. It is important however – as noted in the review of the MD 586 Study – that subsequent analyses begin to address the potential network effect on forecast ridership so that higher end treatments are not automatically eliminated from consideration as alternatives are refined. In the context of the CTCFMP recommendations, the County Executive's 2020 BRT Plan should be viewed as an interim condition leading to more segments with dedicated lanes. This is especially important in the US 29 corridor – given the role of BRT in support of the vision of the White Oak Science Gateway Plan.

Purpose and Need

The Study has not adequately addressed the Purpose and Need for the project. Specifically, the Study acknowledges there is a need to provide mobility options by providing a high frequency, **reliable** transit service.

If the existing bus service has poor reliability operating in mixed traffic, the Study should document the extent to which the BRT build alternatives would improve system reliability in 2040. Additional detail is needed on the following key questions:

- What are the causes of the existing bus reliability problems?

⁹ As an example, the American Public Transportation Association (APTA) 2005 Recommended Practice on Designing Rapid Transit Running Ways includes HOV as an application on freeways but excludes HOV as a feature for arterial design guidelines.

- Where along the corridor do reliability, problems occur today and how will that change in the 2040 No-Build?
- Will the alternatives allow buses and BRT services to bypass these congestion points, thus being able to adhere to bus schedules more consistently?

From a more technical standpoint staff would recommend consideration of whether VISSIM could be used to evaluate these measures, possibly by breaking out the components of the local bus and BRT trips to compare stopped delay, running time, boarding and alighting time (which should increase with more ridership), and simulation events (having to wait through an entire signal cycle length to proceed). One question / comment staff has is whether multiple runs of VISSIM might show variability between bus average travel times, enough to calculate the 95th percentile travel time?

Finally, it may be that there are studies of successful BRT systems where pre/post-studies that have been conducted to quantify the effect of reliability on travel time.

Summary of Comments to be Forwarded

1. If MDOT is not advancing any of the three alternatives in the US 29 BRT Corridor Study Report (CSR), it is important for the CSR to note the improvements that are being implemented as part of the County Executive's 2020 BRT Plan.
2. The Study does not include narrative on why managed lanes require additional analysis or why the additional analysis cannot be conducted now to better evaluate the alternatives. This information should be included in the Final Study Report.
3. If MDOT is not advancing any of the alternatives in the US 29 BRT Corridor Study Report (CSR), the CSR should note when MDOT intends to finish the remaining study needed (managed lanes), choose a preferred alternative, and move forward with advancing the preferred alternative as originally planned.
4. The Final Study Report should provide background on the decision to include HOV-2 as part of two of the build alternatives in the southern segment of the corridor to inform the follow-up analysis that is to take place at some undetermined time in the future.
5. The US 29 2020 BRT Plan as explained to the CAC in January introduces BRT elements in a corridor with right-of-way constraints along certain segments. This is an approach that will likely be repeated in various segments of each corridor identified in the Countywide Transit Corridors Functional Master Plan. It is important however – as noted in the review of the MD 586 Study – that subsequent analyses begin to address the potential network effect on forecast ridership so that higher end treatments are not automatically eliminated from consideration as alternatives are refined. In the context of the CTCFMP recommendations, the County Executive's 2020 BRT Plan should be viewed as an interim condition leading to more segments with dedicated lanes. This is especially important in the US 29 corridor – given the role of BRT in support of the vision of the White Oak Science Gateway Plan.

6. The Study has not adequately addressed the Purpose and Need for the project. If the existing bus service has poor reliability operating in mixed traffic, the Study should document the extent to which the BRT build alternatives would improve system reliability in 2040.

7. Consider whether VISSIM could be used to evaluate these measures, possibly by breaking out the components of the local bus and BRT trips to compare stopped delay, running time, boarding and alighting time (which should increase with more ridership), and simulation events (having to wait through an entire signal cycle length to proceed).

8. Identify studies of successful BRT systems where pre/post-studies that have been conducted to quantify the effect of reliability on travel time.

9. All alternatives appear to have park impacts and all will have impacts to the streams. At the time of more detailed design for the selected alternative, Montgomery Parks will provide detailed comments, including opportunities to improve stormwater discharge into streams on parkland. Montgomery Parks staff should be included in any interagency coordination meetings regarding more detailed design of the selected alternative. In addition, any work on parkland will require a park permit.

Comments of a more technical or editorial nature include the following:

1. There is discrepancy between the average travel times for 2040 No-Build conditions for cars & trucks and for buses between Table ES-2 and Table 3-2a (See table below). Are these both based on VISSIM simulation runs?

Location in Corridor Study Report	Cars & Trucks		Buses	
	SB Average Travel Time (min)	NB Average Travel Time (min)	SB Average Travel Time (min)	NB Average Travel Time (min)
Table 3-2a: 2040 AM	45	21	47	25
Table ES-2: 2040 AM	44	18.6	49.4	27.5
Table 3-2a: 2040 PM	25	37	30	44
Table ES-2: 2040 PM	24.3	35.3	27.3	44.5

2. If the shoulder is being proposed for BRT use for a portion of the corridor, an analysis of the pavement condition of these shoulders, improvement needs and construction costs should be included in the alternative evaluation.
3. Please clarify the travel time/delay reduction benefits to local buses versus BRT in terms of location (segments, intersections, and improvement action)?
4. Please provide additional detail on why the build alternatives retained for further evaluation differ from the recommended plans in the CTCRMP when the CSR discusses what the CTCRMP recommends. For example, the CTCRMP calls for dedicated lanes along the whole alignment except for the stretch of the route on Lockwood Drive, but none of the retained alternatives propose dedicated lanes for the entire corridor.
5. Reducing travel times was a goal of the CTCRMP, but was not an express goal of the US BRT Corridor Study Report. Will reducing travel times be an official goal of future US Route 29 BRT improvements after this first phase?
6. Please check if the “Proposed Interchange in the CLRP (Funded)” as shown in Figure 2-1 (at Fairland Rd?) should be included in Table ES-1: Planned/Programmed Projects, as it is a funded project in the CLRP. If so, please add that interchange to Table ES-1 or explain in a footnote to Figure 2-1 why it is not included in Table ES-1.
7. Table 1-1 notes that the ROW for US 29 from MD 198 to Stewart Lane is 200 ft. However, the Fairland Master Plan notes that the section of US 29 from south of Randolph Rd/Cherry Hill Rd should be between 100 and 200 feet. Please confirm with Steve Aldrich of our Functional Planning and Policy Division if the ROW along this noted section of US 29 should be less than 200 feet for any section.
8. There is an inventory of natural resources, but no indication of if/how they will be impacted.
9. Page 83 last line of 2nd paragraph. Forests, floodplains, and nontidal wetlands are also associated with these stream systems.
10. Alternative A and Alternative Modified B transition from the buses using center lanes in the north to outside or shoulder lanes in the south. Staff is concerned this transition will further slowdown buses in heavy traffic. Therefore, it may be helpful to describe this transition and what can be done to assist in the large merge required mid-way through the route.
11. No BRT Station is planned at the intersection of US Route 29 and Fairland Road as called for in the Countywide Transit Corridors Functional Master Plan (CTCRMP). The Study should include an explanation of why this station was removed.

Attachment D: Scope of Work for US 29 Mobility & Reliability Study

AGENDA ITEM #4
January 30, 2018
Addendum

MEMORANDUM

TO: County Council

FROM: Glenn Orlin, ⁶⁰Deputy Council Administrator

SUBJECT: **Addendum**—US 29 BRT Mobility and Reliability Study

Attached are pertinent documents regarding the funding of this \$425,000 study within the existing appropriation of the Facility Planning-Transportation project:

- January 29, 2018 letter from 17 Silver Spring civic leaders concerning the subject study
©1-4
- December 18, 2017 from six Councilmembers requesting DOT to find funds within its existing budget to begin the subject study
©5-6
- DOT's latest update of the subject study's scope of work
©7-14

f:\orlin\fy18\savings plan\180130cc-addendum.doc

January 29, 2018

The Honorable Hans Riemer
President, Montgomery County Council
100 Maryland Avenue
Rockville, Maryland 20850

RE: County Council January 30, 2018 Agenda Items:

- (4) Public Hearing Amendments to the FY 17-22 Capital Improvements Program Reflecting the County Executive's Savings Plan; and
- (5) Suspension of Rules / Action-Resolution to Approve FY18 Savings Plan; and

Request for Removal of Proposed Supplemental Request for Another Route 29 BRT Study for a Median Guideway; and
Request for Public Notice and Public Hearing for Council's Supplemental Budget Request in Accordance With the Charter of Montgomery County.

Dear Council President Riemer and Members of the County Council:

As community leaders in numerous neighborhoods with more than 15,000 residents located along Route 29 in Silver Spring, we have been actively participating for the last three years in the Corridor Advisory Committee process for the proposed Route 29 Bus Rapid Transit (BRT) project. **As you know, Corridor Advisory Committees (CACs) were established because BRT construction recommendations were not contained in area master and sector plans along the corridor.** The purpose of the CACs is to provide communities with the opportunity to study and address community impacts in a comprehensive manner; provide input to all planning and design; fulfill the County Council requirements for transparency; and serve as a clearinghouse for sharing of timely and accurate information on the studies and plans in each corridor.¹

We are extremely concerned that County Councilmembers are taking actions to undermine this process. After three years of diligent work with the Route 29 CAC, we were astonished to learn that you are ordering a supplemental budget request within a "Savings Plan" for a new Route 29 BRT Median Guideway Study, without holding a public hearing as promised and as *required* by Section 307 of the Charter of Montgomery County. Last year we wrote to you after a hearing was scheduled prematurely for construction and right-of-way acquisition funding for Route 29 BRT construction even though the master plan requires that no County

¹ Purpose and Mission for the Corridor Advisory Committees, MCDOT, February 28, 2015.

funding be provided until the public engagement process has been fulfilled. Although you programmed the construction funding, we still have not been informed of the right of way requirements and the study is still in the planning phase of the project.

Delete Additional Budget Item “US29 Bus Rapid Transit Guideway and Operations”

We are requesting that the additional NEW handwritten budget item buried on © page 228 “US29 Bus Rapid Transit Guideway and Operations” be deleted at this time for the following reasons:

- This additional item is not even mentioned in Dr. Orlin’s memorandum or in any other text in the packet for January 30. The public would have no way of knowing about this additional new project and expenditure being added to the County Executive’s FY18 “Savings Plan”. It is only found if one happens to review every page of the 245 page packet to see the item handwritten in on © 228 as “US 29 BRT Guideway and Operations” under Facility Planning No. 509337, which is separate and apart from No. P501318 Project Description Form which is the stand alone CIP category for all BRT facility planning items. This lack of transparency and absence of public notice and input conflicts with the purpose and mission of the project and fails to meet the Council’s requirements adopted in the Master Plan.²
- Furthermore, Dr. Orlin’s memo states on page ©192:
“Given the ratcheting down of resources for the CIP, the pace of facility planning should also be reduced, so as not to create a backlog of projects”.
Since there is a ratcheting down for the CIP and it is recommended that facility planning should be reduced, new items for a completely different BRT study should not be added at this time, especially since the CAC has been working on the County Executive’s proposal for two years and is in the detailed planning phase and construction is scheduled for this year. Moreover, the County is cutting \$25 million for our schools as well as money for the limited stop service promised for Route 29. You will recall that WMATA had buses ready to implement this long delayed service when MCDOT insisted that they could provide the service for less money which they have now reneged on while providing ~20 million for a similar service on Rockville Pike this same fiscal year.
- Last year when a different conceptual proposal was made public in a Staff memo AFTER the public hearing on the current County Executive proposals, CAC

² Countywide Transit Corridors Functional Master Plan, Approved and Adopted by Montgomery County Council, December 2013

members expressed concern that they were not provided an opportunity to comment on this concept in the public hearing since it was not part of the public hearing packet. A median busway has been studied numerous times both for Route 29 as well as 3 other corridors recently. The concept was always rejected for reasons that have nothing to do with lane width. The CAC has done a tremendous amount of review, analysis and comment on numerous concepts so bringing back a concept that was not advanced for very valid reasons would also undermine the CAC process. In response, President Berliner stated that they would request a cost estimate and scope of work from MCDOT and it would be made public for a public hearing on a supplemental request. Now the Council wants to prevent that public hearing for reasons not explained and is not even providing the details of what is requested.

- Not only did the Council promise to provide the cost estimate, scope of work and public hearing, but public notice of at least one week and public hearing are required by Section 307 of the County Charter of Montgomery County for this request.
- Where is the written justification and explanation for why it is so urgent to add this completely new project at this time, in the middle of a “Savings Plan” in the middle of the Fiscal Year, without the required notice and hearing while other studies are still ongoing? If it were being proposed in the new CIP in FY19, which would be the appropriate time and place for adding a new BRT study, there is a hearing for that.

There is no justification or urgency to providing funds without sufficient public notice or public hearing for another additional study for the Route 29 BRT project. The current project is still in the planning and design phase and all BRT study items for all corridors including Route 29 are under one PDF P501318

In summary, for the reasons outlined above, we respectfully request that:

1. The new budget item “US29 Bus Rapid Transit Guideway and Operations” be deleted at this time from the “Savings Plan”.
2. The County Council provide sufficient public notice and hearing for any new requests for the Route 29 BRT project including study scope changes, as well as for requests for additional funding as required by the Charter of Montgomery County.

Thank you for your consideration and attention to this issue. We look forward to your response and to working with you on this matter of public concern and importance.

Sincerely yours,

Alan Bowser, CAC Representative, Park Hills Civic Association

Carole Ann Barth, CAC Representative, Montgomery County Civic Federation

Sharon Canavan, President Northwood-Four Corners Civic Association

Laurence Dickter, Vice-President South Four Corners Citizens Association

Jay Elvove, President, North Hills of Sligo Civic Association

Roberta Faul-Zeitler, CAC Representative, Woodside Park Civic Association

Melissa Goemann, CAC Representative, Vice-President, Greater Four Corners Alliance

Jonathan Halpern, Transportation Chair, CAC, Sligo-Branview Community Association

Kevin Harris, CAC Representative, Northwood Four Corners Civic Association

Michael McDonough, President, Woodmoor-Pinecrest Citizens Association

Karen Michels, CAC Representative, South Four Corners Citizens Association

Mike Pfetsch, CAC Representative, Woodmoor-Pinecrest Citizens Association

Harriet Quinn, Vice-President, Transportation Chair, Woodmoor-Pinecrest Citizens Association

Michele Riley, CAC Representative, Silver Spring United Methodist Church

Victoria Scavo, President, Burnt Mills Citizens Association

Carolyn Stanek Lucy, President, South Four Corners Citizens Association

James Zepp, CAC Representative, Montgomery County Civic Federation

Cc:

The Honorable Isiah Leggett, Montgomery County Executive

Glenn Orlin, Montgomery County Council Deputy Administrator

Megan Davey Limarzi, Esquire, Clerk of the Council

Federal Transit Administration



MONTGOMERY COUNTY COUNCIL
ROCKVILLE, MARYLAND

ROGER BERLINER
COUNCILMEMBER
DISTRICT 1

CHAIRMAN
TRANSPORTATION, INFRASTRUCTURE
ENERGY & ENVIRONMENT COMMITTEE

December 18, 2017

Mr. Al Roshdiah
Director
Montgomery County Department of Transportation
101 Monroe Street, 10th Floor
Rockville, MD 20850

Dear Director Roshdiah,

Earlier this year, the County Council requested MCDOT submit a supplemental appropriation request in order to study the concept of median dedicated Bus Rapid Transit lanes on US 29 between New Hampshire Avenue and Sligo Creek Parkway. We understand MCDOT prepared such a study, but the County Executive branch has not advanced the associated appropriation request given our County's current budget challenges.

We ask that MCDOT find funding in its existing budget to begin this study. While the County Executive's BRT proposal for US 29 will provide much-needed high-quality transit service, it will feature dedicated bus lanes for less than 40% of the corridor, all of which will be north of the congested area between Sligo Creek Parkway and New Hampshire Avenue. In May, after it became clear that the State Highway Administration was open to the idea of shrinking travel lane widths to allow for median dedicated bus lanes, the Council made clear its view that we must study such a concept between White Oak and Silver Spring as the next phase of BRT on US 29.

The median dedicated BRT lanes proposed for further study between New Hampshire Avenue and Sligo Creek Parkway could help maximize ridership and travel time savings, creating a higher quality of service within the existing roadway while retaining six travel lanes throughout.

We will not know the full potential for this concept until we do the detailed study requested by the Council. We ask that MCDOT prioritize this study by looking for the funds to carry it out without a supplemental appropriation.

Thank you for your attention to this issue and we look forward to your response.

STELLA B. WERNER OFFICE BUILDING • 100 MARYLAND AVENUE, 6TH FLOOR, ROCKVILLE, MARYLAND 20850
240-777-7828 OR 240-777-7900, TTY 240-777-7914, FAX 240-777-7989
WWW.MONTGOMERYCOUNTYMD.GOV

Sincerely,



Roger Berliner
Chairman, T&E Committee
District 1



Hans Riemer
Council President
At-Large



Marc Elrich
At-Large



Tom Hucker
District 5



George Leventhal
At-Large



Nancy Navarro
District 4

CC: Glenn Orlin, Deputy Council Administrator, Montgomery County Council

US 29 Mobility & Reliability Study – Scope of Work

Last Update: 1/30/2018

Tasks

- I. Overview
- II. Public Outreach
- III. Summary of Previous Efforts
- IV. Update Models
- V. Identify Conceptual Improvements & Mobility Package (Past and New)
- VI. Review “Emerson and Smoot” Concepts
- VII. Develop Conceptual Geometric Designs
- VIII. Cost Estimates & Travel Time Benefits

Project Overview

Generally the US 29 Mobility & Reliability Study. Our understanding of the scope of work is to advance a study and alternatives to:

- Examine conceptual roadway operational improvements that will benefit both general traffic and transit travel and have independent merit beyond the US 29 BRT Transit Project.
- Explore an alternative transit BRT guideway design concept

The study would include an evaluation of the median/ reversible lane BRT concept developed by US 29 citizen advisory committee members, Emerson and Smoot, along with assessing intersection and segment improvements with and without future managed lanes. The purpose of the study is to identify improvements or packages of improvements that can be implemented on US 29 to complement the investment in BRT and improve transit, HOV, or overall corridor travel time and reliability performance from Tech Road to the Silver Spring Transit Center.

The proposed scope includes

Public Outreach



Last Update 01/30/2018

1) **Meetings & Conference Calls** - Attend and participate in stakeholder meetings and conference calls.

- ☐ Internal meetings
 - MDOT SHA
 - MDOT MTA
 - Previous consultants
- ☐ External meetings
 - 2 public meetings – Open house with formal presentation.
 - At least one will be held at Blair High School.
- ☐ Newsletter mailing

Deliverables: meeting minutes, project Purpose and Need Statement with goals and objectives, criteria for measures of effectiveness, public meeting displays, newsletter and scripts.

a) **Summarize Past Modeling Efforts, Data Sets, Results** – Obtain, review, and summarize traffic operations (Synchro, VISSIM) and travel forecasting (regional, Corridor and UMD Mesoscopic modeling) efforts in the corridor performed to date including efforts by MWCOG, MTA, SHA, MNCPPC, UMD, and consultants

b) **Transit Operational & Service Planning Efforts** – Summarize Transit Operational & Service Planning efforts in the corridor, signal operations including Transit Signal Priority and BRT/ local transit service planning/coordination efforts to date along with the current expected interim year transit service and signal operations plan.

c) **Update Existing Microsimulation (Synchro and VISSIM) Models** - Update and enhance the existing Synchro and VISSIM models from Tech Road to the Silver Spring Transit Center. Updates will include additional network detail off of US 29 (i.e. Stewart Lane/Lockwood Drive, Wayne Avenue/Ramsey Avenue and the Silver Spring Transit Center). Interchange of I-495 at MD 97, and Interchange of I-495 at MD 193), new peak hour volume sets, signal timings, and transit routes/schedules.

d) **Review and Update Regional MWCOG Model** – Review most recent MWCOG model documentation, inputs (2017, 2025, and 2040 networks, TAZ level land use, and other inputs), and base year validation. Update land use forecasts to be consistent with land use forecasts provided by the Maryland-National Capital Park and Planning Commission/Planning Department, confirm White Oak land use assumptions, and confirm zone and network detail. Revise network and zone detail within the US 29 Study Area as needed to support operational analyses and Run updated 2017, 2025, and 2040 MWCOG models. This will include an update to existing traffic counts if needed.

e) **Develop 2025 and 2040 Traffic Volumes** – Apply NCHRP 255/765 post-processing methods to the existing base year (2017) and 2025/2040 horizon year scenarios travel model output (e.g. ADTs) to produce updated intersection level traffic estimates for the proposed study intersections (peak hour turning and through movements, etc.).

f) **Develop Interim Year (2025) Synchro and VISSIM Models** – Develop Interim Year (2025) VISSIM model. Model will use 2025 Interim Year volumes and include BRT in mixed-traffic, BRT stations,

BRT characteristics, and Transit Signal Priority (TSP) and planned local/feeder transit revisions. It should be noted previous VISSIM models only included unconditional Transit Signal Priority, but these models will be enhanced to include Conditional TSP using VISSIM.

g) Develop Future (2040) No-Build Synchro and VISSIM Models – Update Interim Year VISSIM model to include 2040 traffic volumes. Model will include US 29 BRT in mixed-traffic only.

Deliverables:

- Summary matrix of previous studies/ models/ data sets
- Summary of interim year BRT, local transit service plans and signal operations
- Existing, 2025 Interim and 2040 Future traffic volumes
- Existing, 2025 Interim and 2040 Future Synchro and VISSIM models (US 29 BRT in mixed-traffic only) and measures of performance for each intersection and the overall corridor. The Synchro model will be used for intersection level of service, delay and volume-to-capacity ratio, the VISSIM model will be used for auto and bus travel times.

3) Review and Compare Emerson and Smoot Concept

a) **Compare to MTA/SHA Alternative A and Alternative B Concepts** – Review the concept developed by Sean Emerson and Sebastian Smoot and compare to MTA/SHA's Alternative A and Alternative B including key attributes of each concept, challenges and limitations related to traffic operations, transit operations and right-of-way, utility and environmental impacts. The comparison will also include selective traffic operational analysis or ridership forecasting estimates.

b) **Provide Recommendations on Improvements** – Discuss opportunities and constraints with concepts (e.g. narrowing of lanes, reversible lane impact on service operations) and provide recommendations on improvements.

Deliverables:

- Summary memo and matrix of key attributes of the concept, challenges and limitations and elements merited for inclusion in the options for additional mobility improvements and selective traffic operational analysis or ridership forecasting estimates
- Cost Estimates and geometric designs will be developed (See cost estimate and concept development tasks)

4) Develop Options for Additional Mobility Improvements

a) **Station Access and Pedestrian and Bicycle Improvements** – Identify potential pedestrian and bicycle improvements (e.g. new bike and pedestrian infrastructure as well as prioritization treatments to existing non-motorized infrastructure at select intersections/ segments) to provide a contiguous non-motorized network within the study area and enhanced station area walk/ bike shed. The September 2017 Bicycle and Pedestrian Workshop Comments will be reviewed for

feasibility, as well as other relevant Master/ Sector Plan documents (e.g. White Oak, County Bikeway Master Plan). Any adverse impacts to existing pedestrian and bicycle facilities/accessibility due to other proposed roadway improvements will be noted and mitigation identified and developed if needed.

b) **Summarize Previous Roadway Improvement Recommendations** – Summarize previous intersection/ roadway improvement concepts including short-mid and long term example improvements considered such as, but not limited to:

- **US 29 at I-495** – Summarize and provide additional detail of the choice exit lane, ramp widening and part-time I-495 shoulder use
- **US 29 at MD 193 (University Boulevard)** – summarize and provide additional detail on turn restrictions/ diversions
- **US 29 at MD 650** – summarize and provide additional detail of the structure / roadway widening
- **US 29 at Tech Road/ Industrial Road** – alternative intersection design such as jughandle, displaced lefts, continuous flow, spur/ satellite intersections
- **Managed Lane Options/Recommendations** – Review and summarize previous efforts for managed lanes on US 29 including HOV-2 and HOV-3 between MD 97 and Tech Road.

c) **Develop Interim Year (2025) Traffic Models with Recommended Improvement Package (Without Managed Lane)** – Model Interim Year (2025) in Synchro and identify up to ten (10) potential improvements at critical intersections/hot spots and develop mitigation strategies/concepts. Signing, marking, signalization and other physical intersection or mainline improvements will be considered including additional turn lanes, turn lane extensions, lane reassignment, turn restrictions, signal phasing/timing, and traffic control changes.

Develop VISSIM model for the recommended interim year mobility package and evaluate improvements in auto and bus travel time and reliability. It is anticipated that several iterations of packages will be tested (e.g. I-495/ US 29 improvements only, traffic control changes only).

d) **Develop Future (2040) “Mobility” Build Traffic Model (With Managed Lane)** – Model Future Year (2040) “Mobility” Build with Managed Lane in Synchro and identify up to ten (10) potential improvements at critical intersections/hot spots and develop mitigation strategies/concepts. **Previously recommended alternatives for the interim year managed lane option will be tested for year 2040 and new recommendations for new managed lane alternatives will be developed.** Signing, marking, signalization and other physical intersection or mainline improvements will be considered including additional turn lanes, turn lane extensions, lane reassignment, turn restrictions, signal phasing/timing, traffic control changes, and intersection approach mixing areas.

Develop VISSIM traffic simulation model for the recommended long-term managed lane (i.e. HOV2+) and evaluate improvements in auto and bus travel time and reliability. It is anticipated that several iterations of packages will be tested (e.g. HOV 2 vs. HOV 3, 10% mode shift).

e) **Develop Summary Matrix** – Develop a summary matrix comparing operational benefits (intersection level of service/delay/ volume-to-capacity ratio), cost estimates, right-of-way impacts, etc. of each scenario.

f) **Agency Review:** Obtain input from County DOT and SHA on improvement options for each location.

Deliverables:

- Individual improvement menu package by location, mode and design year (interim, long-term) including traffic operations, costs, concept design, and ped./bike walkshed.

5) Finalize Mobility Improvement Package

This task will advance the mobility improvement menu to develop a specific package of improvements that can achieve the best corridor-level benefit and determine implementation



strategies (e.g. short-term, long-term, developer improvement, geographic focus such as northern section).

a) **Develop Schematic Concepts** – Develop schematic concepts (e.g. PowerPoint or ‘stick’ lane configurations) for up to ten (10) improvements for each of the Interim Year (2025) and Future Year (2040). The concepts will identify new pavement/geometry and potential right-of-way needs.

b) **Finalize Menu** - Revise improvements (analysis, concepts, costs) and develop a finalized mobility menu.

c) **Develop Improvement Packages** – identify effective combinations of improvements such as lowest cost, segmentation by corridor geography, short-term vs. long-term and with and without managed lanes.

d) **Review and Update University of Maryland (UMD) Mesoscopic Model** – Review past modeling DTA and mesoscopic model efforts by UMD and prepare assessment of steps and effort to transfer/update based upon most recent information/data (transfer/install, update inputs using most recent data sources, validate to base year conditions, input/code future scenarios, summarize results). Upon approval of work plan by MC DOT Task Manager, update DTA/mesoscopic subarea models for US 29 corridor and carryout scenario analyses to capture managed lanes and ensure the recommended mobility packages can accommodate regional influences such as latent demand, peak hour spreading/consolidation, route diversions to/from the US 29 corridor, etc.

e) **Finalize Mobility Package Recommendation and Phasing** – Determine the final mobility package for 2025 and 2040 based on the VISSIM and mesoscopic modeling.

Deliverable

- Mobility package for 2025 and 2040 including location, improvement type, mode, overall expected operational improvements (e.g. travel time, person-throughput and reliability), and concept plan (interim, long-term)

6) Public Involvement

- US 29 Mobility Workshop #1 – Intro Concepts
 - North workshop
 - South workshop
- US 29 Mobility Workshop #2 – Present Findings
 - North workshop
 - South workshop

7) Technical Report – Prepare a technical report summarizing previous studies, updated modeling and data, additional improvement development and analysis, and recommendations including mobility package options.

Cost Estimation and Geometric Alternatives

This task will consist of evaluating and preparing various concept level roadway improvements plans and construction cost estimates associated with the US 29 Corridor Mobility & Reliability Study and the median/ reversible lane BRT concept developed by Emerson and Smoot. The study will evaluate various alternatives to improve both general traffic and transit travel time and reliability within the US 29 corridor from Tech Road to the Silver Spring Transit Center. The concept plans will include intersection and segment improvements with and without future managed lanes. The purpose of the study is to consider improvements or packages of improvements that can be implemented along US 29 to complement the investment in BRT and improve transit, HOV, or overall corridor performance.

For purposes of this proposal, we have assumed the following types of improvements or similar could be evaluated:

- Widening for hard running shoulder/through lane between Tech Road and MD 650
- Hard Running Shoulder on I-495 Outer Loop between US 29 and Georgia Avenue and associated ramp work
- Lockwood Drive BRT Signal/Station at Hillwood Drive (Closes vehicle access to Hillwood Drive and move pedestrian crossing from Burnt Mills Shopping Center signal)
- Closure of 5th Leg of Sligo Creek Parkway/St Andrews Way at US 29
- Addition of a westbound right turn lane along Tech Road to northbound US 29
- Widening and road closure associated with the Lockwood Drive BRT Station
- Side street widening approximately 250' along both eastbound and westbound legs of Sligo Creek Parkway at US 29
- Geometric improvements developed by Emerson and Smoot (To be completed by T3)

Cost Estimation & Geometry: TASK 1- Data Collection

Perform site visits to each of the improvement locations along the US 29 from Silver Spring Transit Center (MP 0.67) to Tech Road (MP 6.38) a total of 5.71 miles. Base plans will be assembled from GIS data and tape and wheel survey, as-built plans, utility record plans, right of way plats, adjacent subdivision plats and any other available and pertinent information.

Cost Estimation & Geometry: TASK 2 – Develop Geometric Alternatives

Develop concept roadway geometric improvement plans to support the analyzed improvements. These plans will also include concept drainage and structural needs associated with the improvements.

A conflict/summary of impacts assessment will be developed for each location that will identify potential impacts to utilities, environmental features, right of way and cultural resources. A concept level cost estimate will be developed for each location, based on recent unit bid prices.

Each alternate will be shown on a plan view and conceptual typical sections developed. However, due to limited survey data, vertical analysis (profiles and cross sections) will not be developed as part of this analysis.

Provide concept level plan view, a conflict/summary of impacts and construction cost estimate for the improvements outlined in the Emerson and Smoot analysis.

Schedule –approximate 12 month completion schedule for this study

Attachment E: US 29 Master-Planned Right-of-Way

Excerpt from the Countywide Transit Corridors Functional Master Plan

Road	From	To	Dedicated Lanes?	ROW**	Max Additional Lanes (for Transit)
US 29	MD 198	Stewart Lane	Yes	200	2
Stewart Lane	US 29	Lockwood Drive	No	80	0
Lockwood Drive	Stewart Lane	New Hampshire Avenue	No	80	0
Lockwood Drive	New Hampshire Avenue	US 29	No	80	0
US 29	Stewart Lane	Lockwood Drive	Yes	122	0
US 29	Lockwood Drive	Southwood Avenue	Yes	122	0
US 29	Southwood Avenue	Sligo Creek Parkway	Yes	120	0
US 29	Sligo Creek Parkway	Fenton Street	Yes*	120	0
US 29	Fenton Street	Georgia Avenue	Yes*	100	0
Colesville Road	Georgia Avenue	East West Highway	Yes	125	0
Colesville Road	East West Highway	16th Street	Yes	125	0

* The six existing general purpose lanes in the these segments currently operate during peak hours as four in the peak direction and two in the off-peak direction; in off-peak hours, they operate as three lanes in each direction. This Plan recommends that the operation in peak hours there be dedicated lane in the peak

** Reflects the minimum right-of-way, and may not include land needed for spot improvements, such as turn lanes and stations.

Attachment F: US 29 Mobility & Reliability Study – Appendix III

Appendix III: Pedestrian and Bicycle Improvements

Graphics and Tables for Each Station

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

Station 1 Map Key	Recommendation	Source	Category	Station Overlap
A	Pedestrian bridge connecting Silver Spring Transit Center, MARC Station and Metrorail station.	Purple Line Functional Plan	Bike/Pedestrian Bridges	2
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.		Sidewalks	2
C	Sharrow markings, "Bicycle May Use Full Lane" signage, and "Bicycle Route" signage on 2nd Avenue between Fenwick Lane and US 29.	Bicycle and Pedestrian Priority Area Silver Spring CBD	Shared Roadways	2
D	Add crosswalk and pedestrian signal at US 29 and North Noyes Drive.		Intersection Safety Improvements	2
E	Add crosswalk and pedestrian signal on north side of US 29 and Spring Street intersection.		Intersection Safety Improvements	2
F	Add pedestrian refuge medians on southwest and northwest legs of US 29 and Georgia Avenue intersection.		Intersection Safety Improvements	2
G	Add crosswalk to northeast leg of US 29 and Silver Spring Transit Center Entrance.		Intersection Safety Improvements	
H	Continue bi-directional bike lane to Grubb Road.		Separated Bike Lanes	
I	Add 5 ft minimum sidewalks to Fairview Road between Spring Street and Noyes Drive.		Sidewalks	2
J	Add 5 ft minimum sidewalks to Alton Parkway between Noyes Drive and Spring Woodland Drive.		Sidewalks	2
K	Add 5 ft minimum sidewalks on Noyes Drive between Alton Parkway and US 29.		Sidewalks	2
L	Separated bike lanes (both sides) on US 29 from 16th St to Wayne Ave	Montgomery County Bicycle Master Plan	Separated Bike Lanes	2
M	Separated Bike Lanes (Two-Way, East Side) on US 29 from Wayne Ave to Georgia Avenue	Montgomery County Bicycle Master Plan	Separated Bike Lanes	2
N	Separated Bike Lanes (Two-Way, North Side) on East West Highway from 16th St to Georgia Ave	Montgomery County Bicycle Master Plan	Separated Bike Lanes	2
O	Separated Bike Lanes (Two-Way, East Side) on 16th Street from DC to Georgia Avenue	Montgomery County Bicycle Master Plan	Separated Bike Lanes	2
P	Off-Street Trail (Metropolitan Branch Trail) on elevated structure from Fenton Street to S Springwood Drive	Montgomery County Bicycle Master Plan	Bike/Pedestrian Bridges	2
Q	Neighborhood Greenway / Shared Roadway on 2nd Ave from Spring St to 16th Street	Montgomery County Bicycle Master Plan	Shared Roadways	2
R	Separated Bike Lanes (Side TBD) on 2nd Ave/ Wayne from Cedar Street to Spring Street	Montgomery County Bicycle Master Plan	Separated Bike Lanes	2
S	Neighborhood Greenway / Shared Roadway on Woodland Drive from Spring Street to Columbia Boulevard and Alton Parkway from Spring Street to Highland Drive	Montgomery County Bicycle Master Plan	Shared Roadways	2
T	Separated Bike Lanes (Two-Way, West Side) on Fenton Street from King Street to Spring Street	Montgomery County Bicycle Master Plan	Separated Bike Lanes	2
U	Separated Bike Lanes (Side TBD) on Cameron Street from Spring Street to 2nd Avenue	Montgomery County Bicycle Master Plan	Separated Bike Lanes	2
V	Shared Street on Ellsworth Dr from Fenton Street to Georgia Avenue	Montgomery County Bicycle Master Plan	Shared Roadways	2
W	Separated bike lanes (two-way, east side) on Ellsworth Drive from Spring Street to Fenton Drive	Montgomery County Bicycle Master Plan	Separated Bike Lanes	2
X	Neighborhood Greenway / Shared Roadway on Ellsworth Drive from Spring Street to Bennington Road	Montgomery County Bicycle Master Plan	Shared Roadways	2
Y	Neighborhood Greenway / Shared Roadway on Cedar Street from Wayne Street to Bonifant Street	Montgomery County Bicycle Master Plan	Shared Roadways	2
Z	Neighborhood Greenway / Shared Roadway on Bonifant Street from Cedar Street to Grove Street	Montgomery County Bicycle Master Plan	Shared Roadways	2
AA	Neighborhood Greenway / Shared Roadway on Grove Street from Bonifant Street to Sligo Avenue	Montgomery County Bicycle Master Plan	Shared Roadways	2
AB	Enclosed Bicycle Parking Station at Silver Spring Transit Center	Montgomery County Bicycle Master Plan	Bike Parking	
AC	Separated Bike Lanes (Side TBD) on 13th Ave/ Burlington Avenue from DC to Fenton Street	Montgomery County Bicycle Master Plan	Separated Bike Lanes	
AD	Priority Shared Lane Markings / Shared Roadway on Philadelphia Ave / Gist Ave from Selim Road to Takoma Ave	Montgomery County Bicycle Master Plan	Shared Roadways	
AE	Neighborhood Greenway / Shared Roadway on Woodbury Drive (Dead end south of Sligo Ave) to Sligo Avenue	Montgomery County Bicycle Master Plan	Shared Roadways	
AF	Separated bike lanes (both sides) on Dixon Avenue from Wayne Avenue to Georgia Avenue	Montgomery County Bicycle Master Plan	Separated Bike Lanes	2
AG	Priority Shared Lane Markings/ Shared Roadway on Silver Spring Avenue from Georgia Avenue to Fenton Street	Montgomery County Bicycle Master Plan	Shared Roadways	2

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

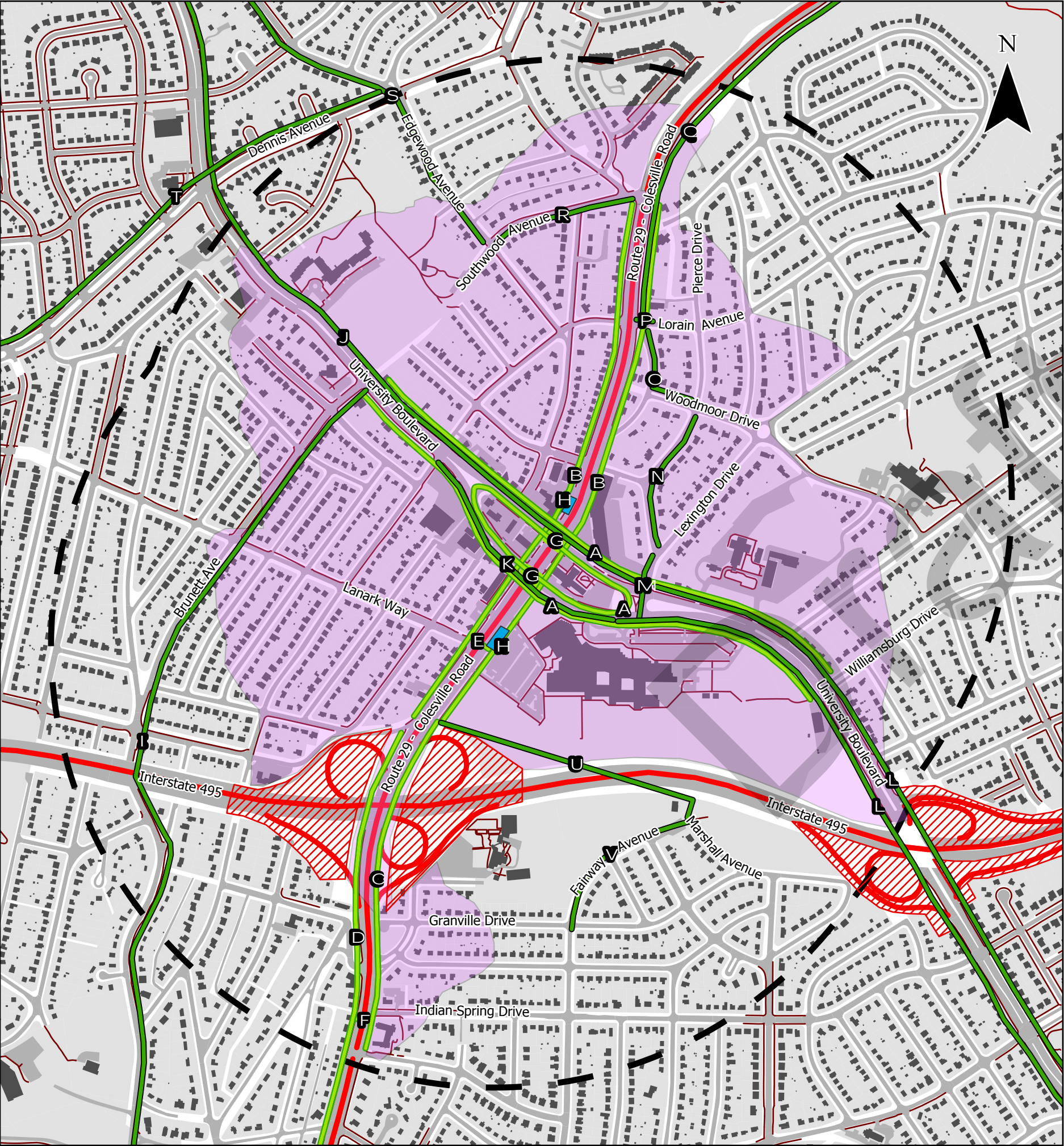
Legend

- 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

Station 2 Map Key	Recommendation	Source	Category	Station Overlap
A	10 ft wide pedestrian bridge connecting Silver Spring Transit Center, MARC Station and Metrorail station.	Purple Line Functional Plan	Bike/Pedestrian Bridges	1
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.		Sidewalks	1
C	Sharrow markings, "Bicycle May Use Full Lane" signage, and "Bicycle Route" signage on 2nd Avenue between Fenwick Lane and US 29.	Bicycle and Pedestrian Priority Area Silver Spr	Shared Roadways	1
D	Improve pedestrian space and adding bus stop amenities such as shelter and bus arrival information.		Transit Facilities	
E	Remove parking in order to accommodate BRT Platform.		Transit Facilities	
F	Include bike racks at BRT Station.		Intersection Safety Improvements	
G	Add pedestrian refuge medians on southwest and northwest legs of US 29 and Georgia Avenue intersection.		Intersection Safety Improvements	1
H	Add crosswalk and pedestrian signal on north side of US 29 and Spring Street intersection.		Intersection Safety Improvements	1
I	Add crosswalk and pedestrian signal at US 29 and North Noyes Drive.		Intersection Safety Improvements	1
J	Extend sidewalks on Dale Drive further to the West to connect to Georgia Avenue.		Sidewalks	
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.		Sidewalks	1
L	Add 5 ft minimum sidewalks on Noyes Drive between Alton Parkway and US 29.		Sidewalks	1
M	Add 5 ft minimum sidewalks to Fairview Road between Spring Street and Noyes Drive.		Sidewalks	1
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.		Sidewalks	1
O	Separated Bike Lanes (both sides) on US 29 from 16th St to Wayne Ave	Montgomery County Bicycle Master Plan	Separated Bike Lanes	1
P	Separated Bike Lanes (Two-Way, East Side) on US 29 from Wayne Ave to Georgia Avenue	Montgomery County Bicycle Master Plan	Separated Bike Lanes	1
Q	Separated Bike Lanes (Two-Way, North Side) on East West Highway from 16th St to Georgia Ave	Montgomery County Bicycle Master Plan	Separated Bike Lanes	1
R	Separated Bike Lanes (Two-Way, East Side) on 16th Street from DC to Georgia Avenue	Montgomery County Bicycle Master Plan	Separated Bike Lanes	1
S	Off-Street Trail (Metropolitan Branch Trail) on elevated structure from Fenton Street to S Springwood Drive	Montgomery County Bicycle Master Plan	Bike/Pedestrian Bridges	1
T	Neighborhood Greenway / Shared Roadway on 2nd Ave from Spring St to 16th St	Montgomery County Bicycle Master Plan	Shared Roadways	1
U	Separated Bike Lanes (Side TBD) on 2nd Ave/ Wayne from Cedar Street to Spring Street	Montgomery County Bicycle Master Plan	Separated Bike Lanes	1
V	Neighborhood Greenway / Shared Roadway on Woodland Drive from Spring Street to Columbia Boulevard and Alton Parkway from Spring Street to Highland Drive	Montgomery County Bicycle Master Plan	Shared Roadways	1
W	Separated Bike Lanes (Two-Way, West Side) on Fenton Street from King Street to Spring Street	Montgomery County Bicycle Master Plan	Separated Bike Lanes	1
X	Separated Bike Lanes (Side TBD) on Cameron Street from Spring Street to 2nd Avenue	Montgomery County Bicycle Master Plan	Separated Bike Lanes	1
Y	Shared Street on Ellsworth Dr from Fenton Street to Georgia Avenue	Montgomery County Bicycle Master Plan	Shared Roadways	1
Z	Separated bike lanes (two-way, east side) on Ellsworth Drive from Spring Street to Fenton Drive	Montgomery County Bicycle Master Plan	Separated Bike Lanes	1
AA	Neighborhood Greenway / Shared Roadway on Ellsworth Drive from Spring Street to Bennington Road	Montgomery County Bicycle Master Plan	Shared Roadways	1
AB	Neighborhood Greenway / Shared Roadway on Cedar Street from Wayne Street to Bonifant Street	Montgomery County Bicycle Master Plan	Shared Roadways	1
AC	Neighborhood Greenway / Shared Roadway on Bonifant Street from Cedar Street to Grove Street	Montgomery County Bicycle Master Plan	Shared Roadways	1
AD	Neighborhood Greenway / Shared Roadway on Grove Street from Bonifant Street to Sligo Avenue	Montgomery County Bicycle Master Plan	Shared Roadways	1
AE	Separated bike lanes (both sides) on Dixon Avenue from Wayne Avenue to Georgia Avenue	Montgomery County Bicycle Master Plan	Separated Bike Lanes	1
AF	Priority Shared Lane Markings/ Shared Roadway on Silver Spring Avenue from Georgia Avenue to Fenton Street	Montgomery County Bicycle Master Plan	Shared Roadways	1

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:

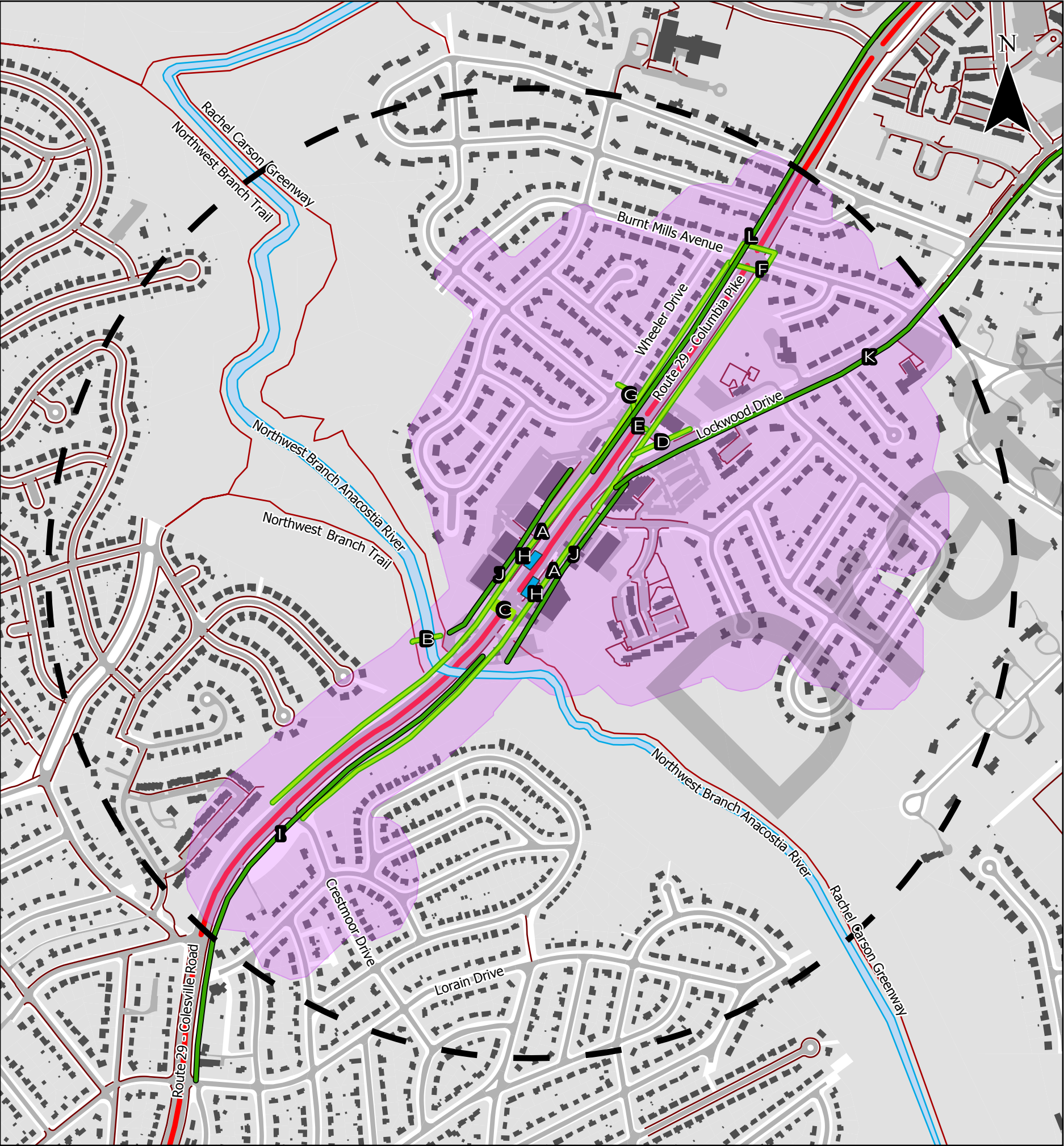
- I Neighborhood Greenway / Shared Roadway on Brunett Avenue from University Boulevard to Sligo Creek Parkway
- J Separated Bikeways (Sidepath, East Side) on University Boulevard from Lexington Drive to Reedie Drive
- K Separated Bikeways (Sidepath, West Side) on University Boulevard from Lexington Drive 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

Station 3 Map Key	Recommendation	Source	Category	Station Overlap
A	Widen sidewalks on University Boulevard to a minimum of 6 ft from Brunett Avenue to Williamsburg Drive.	Four Corners Master Plan and Countywide Transit Corridors Functional Master Plan	Sidewalks	
B	Widen sidewalks on US 29 to a minimum of 6 ft from I-495 ramps to Southwood Avenue.		Sidewalks	
C	Install new bike bridge over I-495 on US 29.	Four Corners Master Plan	Bike/Pedestrian Bridges	
D	Widen sidewalks on west side of US 29 to a minimum of 5 ft from I-495 to Sligo Creek Parkway. 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).		Sidewalks	
E			Intersection Safety Improvements	Intersection Safety Improvements
F	Add pedestrian-activated signal (HAWK or RRFB) at existing crosswalk at US 29 and Indian Spring Drive. Consider deployment of Capital Bikeshare in Four Corners and White Oak, due to proximity to existing stations in Silver Spring and Wheaton.			
G			Bikeshare	
H	Include bike racks at BRT station platforms.		Bike Parking	
I	Neighborhood Greenway / Shared Roadway on Brunett Avenue from University Boulevard to Sligo Creek Parkway	Montgomery County Bicycle Master Plan	Shared Roadways	
J	Separated Bikeways (Sidepath, East Side) on University Boulevard from Lexington Drive to Reddie Drive	Montgomery County Bicycle Master Plan	Sidepaths	
K	Separated Bikeways (Sidepath, West Side) on University Boulevard from Lexington Drive to Lorain Avenue	Montgomery County Bicycle Master Plan	Sidepaths	
L	Separated bike lanes (both sides) on University Boulevard from Lexington Drive to Langley Drive	Montgomery County Bicycle Master Plan	Separated Bike Lanes	
M	Separated Bikeways (Sidepath, West Side) on Lexington Drive from Pierce Drive to University Boulevard	Montgomery County Bicycle Master Plan	Sidepaths	
N	Neighborhood Greenway / Shared Roadway on Pierce Drive from Lexington Drive to Woodmoor Drive	Montgomery County Bicycle Master Plan	Shared Roadways	
O	Neighborhood Greenway / Shared Roadway on Woodmoor Drive and Woodmoor Circle from Pierce Drive to Lorain Avenue	Montgomery County Bicycle Master Plan	Shared Roadways	
P	Neighborhood Greenway / Shared Roadway on Lorain Avenue from Woodmoor Circle to US 29	Montgomery County Bicycle Master Plan	Shared Roadways	
Q	Separated Bikeways (Sidepath, East Side) on US 29 from Lorain Avenue to Rachel Carson Greenway	Montgomery County Bicycle Master Plan	Sidepaths	4
R	Neighborhood Greenway / Shared Roadway on Southwood Avenue from US 29 to Edgewood Avenue	Montgomery County Bicycle Master Plan	Shared Roadways	
S	Neighborhood Greenway / Shared Roadway on Edgewood Avenue from Southwood Avenue to Eisner Street	Montgomery County Bicycle Master Plan	Shared Roadways	
T	Separated Bikeways (Sidepath, North Side) on Dennis Avenue from Edgewood Avenue to Douglas Avenue	Montgomery County Bicycle Master Plan	Sidepaths	
U	Pedestrian/ Bike bridge over I-495 from US 29 to Indian Spring Terrace Park	Montgomery County Bicycle Master Plan	Bike/Pedestrian Bridges	
V	Neighborhood Greenway / Shared Roadway on Fairway Avenue from Marshall Avenue to Granville Drive	Montgomery County Bicycle Master Plan	Shared Roadways	

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

Station 4 Map Key	Recommendation	Source	Category	Station Overlap
A	Add 6 ft wide minimum sidewalks on both sides of US 29 from Crestmoor Drive to Burnt Mills Avenue.	Four Corners Master Plan and Countywide	Sidewalks	5
B	Add pedestrian bridge over Northwest branch connecting Burnt Mills West Special Park to Northwest Branch Trail.	Transit Corridors Functional Master Plan	Bike/Pedestrian Bridges	
C	Widen median to accommodate pedestrian refuge for safe road crossing on north leg of US 29 and Holy Cross Health Entrance.	Countywide Bike Master Plan	Intersection Safety Improvements	
D	Add minimum 6 ft sidewalks to west side of northbound Lockwood Drive.		Sidewalks	5
E	Add crosswalk and pedestrian signal to south leg of US 29 and southbound Lockwood Drive intersection.		Intersection Safety Improvements	
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.		Intersection Safety Improvements	
G	Improve pedestrian path between Wheeler Drive and US 29 to make it ADA compliant.		Off-Street Trails	
H	Include bike racks at BRT station platforms.		Bike Parking	
I	Separated Bikeways (Sidepath, East Side) on US 29 from Lorain Avenue to Rachel Carson Greenway including new bike bridge over Northwest Branch.	Montgomery County Bicycle Master Plan	Sidepaths	3, 5
J	Separated Bikeways (Sidepath, both sides of Road) on US 29 from Rachel Carson Greenway to Lockwood Drive	Montgomery County Bicycle Master Plan	Sidepaths	5
K	Separated Bikeway (Sidepath, east side) on Lockwood Drive from New Hampshire Avenue to Columbia Pike	Montgomery County Bicycle Master Plan	Sidepaths	5
L	Separated Bikeway (Sidepath, west side) on US 29 from Lockwood Drive to Tech Road	Montgomery County Bicycle Master Plan	Sidepaths	5, 6, 7, 8

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

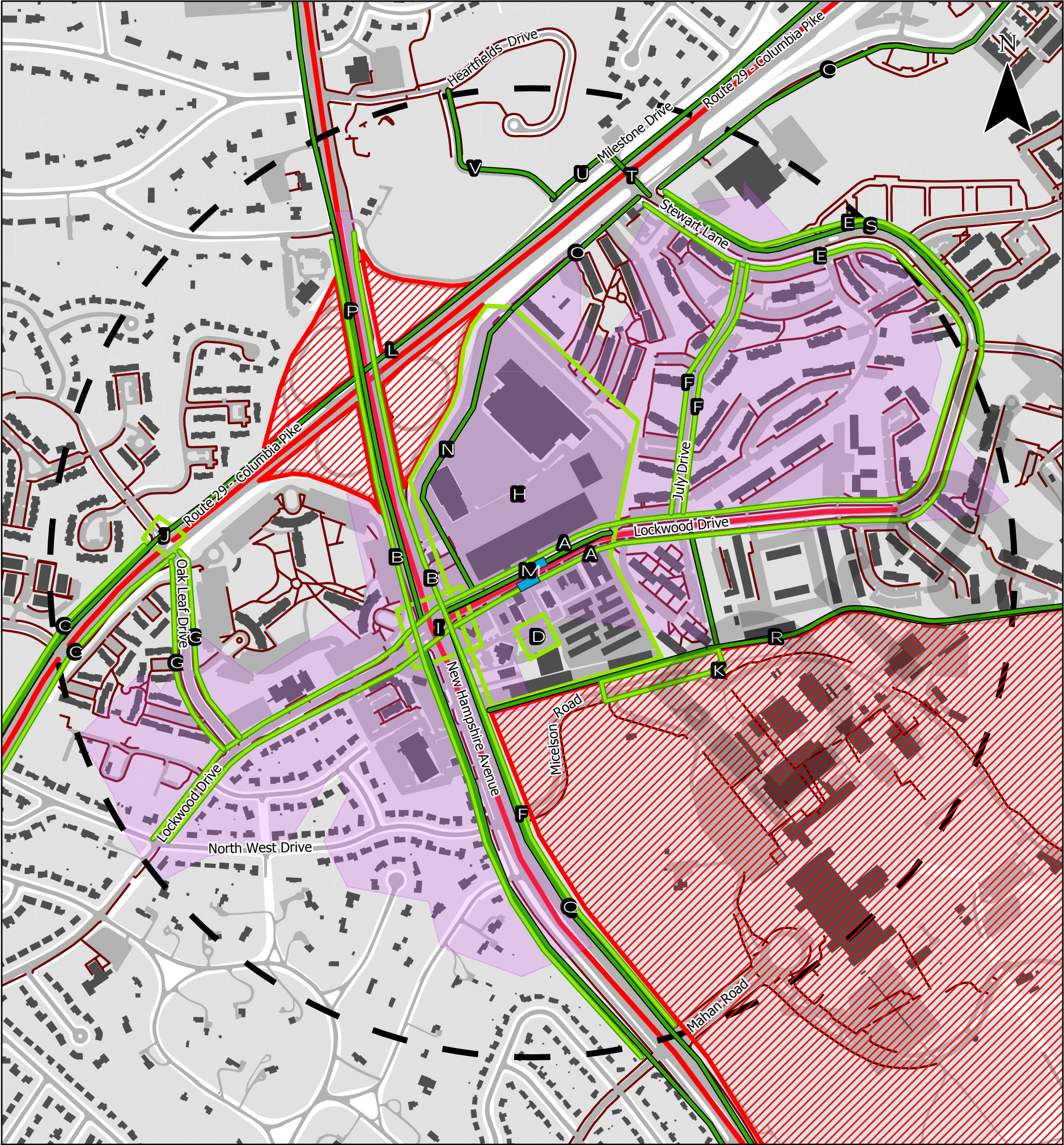
- A Add 6 ft wide minimum sidewalks on both sides of US 29 from Crestmoor Drive to Burnt Mills Avenue (per Four Corners Master Plan and Countywide Transit Corridors Functional Master Plan).
 - B Add 6 ft wide minimum sidewalks on both sides of Lockwood drive from US 29 to New Hampshire Avenue (per Countywide 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

Station 5		Source	Category	Station Overlap
Map Key	Recommendation			
A	Add 6 ft wide minimum sidewalks on both sides of US 29 from Crestmoor Drive to Burnt Mills Avenue.	Four Corners Master Plan and Countywide Transit Corridors Functional Master Plan	Sidewalks	4
B	Add 6 ft wide minimum sidewalks on both sides of Lockwood drive from US 29 to New Hampshire Avenue.	Countywide Transit Corridors Functional Master Plan	Sidewalks	4, 6, 7
C	Add 5 ft wide minimum sidewalks on both sides of North West Drive from Childs Street to New Hampshire Avenue.		Sidewalks	
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.		Intersection Safety Improvements	
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.		Intersection Safety Improvements	6
F	Enable pedestrian crossing at Oak Leaf Drive and US 29 through a redesign of the intersection.		Intersection Safety Improvements	6
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.		Intersection Safety Improvements	4
H	Add 5 ft wide minimum sidewalks on both sides of Burnt Mills Drive between US 29 and Lockwood Drive.		Sidewalks	
I	Add bike storage at BRT station location.		Bike Parking	
J	Add 5 ft wide minimum sidewalks on both sides of Oak Leaf Drive from US 29 to Lockwood Drive.		Sidewalks	6
K	Separated bikeways (Sidepath, both sides) on US 29 from Rachel Carson Greenway to Lockwood Drive	Montgomery County Bicycle Master Plan	Sidepaths	4
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	Montgomery County Bicycle Master Plan	Sidepaths	4, 6, 7, 8
N	Separated bikeway (Sidepath, west side) on New Hampshire Avenue from Lockwood Drive to Jackson Road	Montgomery County Bicycle Master Plan	Separated Bike Lanes	6, 7
O	Separated bikeway (Sidepath, both sides) on New Hampshire Avenue from Lockwood Drive to Oaklawn Drive	Montgomery County Bicycle Master Plan	Sidepaths	6
P	Off-street Trail connecting Lockwood Drive and New Hampshire Avenue.	Montgomery County Bicycle Master Plan	Sidepaths	6
Q	Separated Bikeway (Sidepath, east side) on Old Columbia Pike from White Oak Shopping Center to Stewart Lane	Montgomery County Bicycle Master Plan	Off-Street Trails	6, 7
R	Separated Bikeway (sidepath, east side) on Lockwood Drive from White Oak Park Drwy to New Hampshire Avenue	Montgomery County Bicycle Master Plan	Sidepaths	6, 7

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

Station 6

Map Key	Recommendation	Source	Category	Station Overlap
		Countywide Transit Corridors Functional Master Plan		
A	Add 6 ft wide minimum sidewalk on both sides of Lockwood Drive from North West Drive to Stewart Lane.		Sidewalks	5, 7
B	Add 6 ft minimum sidewalks on both sides of New Hampshire Avenue from Milestone Drive to Mahan Drive.		Sidewalks	
C	Add 6 ft minimum sidewalks on both sides of US 29 from North West Drive to Oak Leaf Drive.		Sidewalks	
D	Accommodate bike storage by providing bike corrals at nearby parking lots.		Bike Parking	
E	Add 6 ft minimum sidewalk on both sides of Stewart Lane from US 29 to Lockwood Drive.		Sidewalks	7
F	Add 5 ft minimum sidewalks on both sides of July Drive.		Sidewalks	7
G	Add 5 ft minimum sidewalks on both sides of Oak Leaf Drive from US 29 to Lockwood Drive.		Sidewalks	5
	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.	White Oak Science Gateway Master Plan	Roadway Modifications	7
H	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.		Intersection Safety Improvements	5, 7
I	Enable pedestrian crossing of US 29 at Oak Leaf Drive through redesign of the intersection.		Intersection Safety Improvements	5
J	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.		Access Improvements	
K	Separated Bikeway (sidepath, west side) on US 29 from Lockwood Drive to Tech Road	Montgomery County Bicycle Master Plan	Sidepaths	5, 7, 8
L	Separated Bikeway (sidepath, east side) on Lockwood Drive from White Oak Park Drwy to New Hampshire Avenue	Montgomery County Bicycle Master Plan	Sidepaths	5, 7
M	Separated Bike Lanes (Two-Way, East Side) on Old Columbia Pike through White Oak Shopping Center	Montgomery County Bicycle Master Plan	Separated Bike Lanes	5, 7
N	Separated Bikeway (sidepath, east side) on Old Columbia Pike from White Oak Shopping Center to Tech Road	Montgomery County Bicycle Master Plan	Sidepaths	7
O	Separated bikeway (sidepath on west side) on New Hampshire Avenue from Lockwood Drive to Jackson Road	Montgomery County Bicycle Master Plan	Sidepaths	5
P	Separated bikeway (sidepath on both sides of street) on New Hampshire Avenue from Lockwood Drive to Oaklawn Drive	Montgomery County Bicycle Master Plan	Sidepaths	5
Q	Off-street Trail from New Hampshire Avenue to FDA Boulevard, with spur connecting to Lockwood Drive	Montgomery County Bicycle Master Plan	Off-Street Trails	5, 7
R	Extend bike lanes on Stewart Lane to Old Columbia Pike	Montgomery County Bicycle Master Plan	Conventional Bike Lanes	7
S				
T	Create pedestrian/ bike crossing of US 29 on Stewart Lane in the form of a sidepath from Old Columbia Pike to Milestone Drive	Montgomery County Bicycle Master Plan	Intersection Safety Improvements	7
U	Separated Bikeway (sidepath, west side) on Milestone Drive from Sherbrooke Woods Lane to Stewart Lane	Montgomery County Bicycle Master Plan	Sidepaths	7
V	Neighborhood Greenway / Shared Roadway on Sherbrooke Woods Lane from Milestone Drive to Heartfields Drive	Montgomery County Bicycle Master Plan	Shared Roadways	7

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

Station 7		Source	Category	Station Overlap
Map Key	Recommendation			
A	Add 6 ft minimum sidewalk on both sides of Stewart Lane from US 29 to Lockwood Drive.	Countywide Transit Corridors Functional Master Plan	Sidewalks	6
B	Add 6 ft wide minimum sidewalk on both sides of Lockwood Drive from New Hampshire Avenue to Stewart Lane.		Sidewalks	6
C	Add 5 ft minimum sidewalks on both sides of July Drive.		Sidewalks	6
D	Include bike racks at BRT Station.		Bike Parking	
	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.	White Oak Science Gateway Master Plan	Roadway Modifications	6
E			Sidewalks	
F	Add 5 ft minimum sidewalk on east side of Old Columbia Pike from White Oak Shopping Center to Tree Top View Terrace.		Sidewalks	
G	Improve sidewalk on west side of Milestone Drive from Eden Road to Sherbrooke Woods Lane.		Off-Street Trails	
H	Create pedestrian path from Milestone Drive to Caplinger Road.	Montgomery County Bicycle Master Plan	Sidewalks	
I	Add 5 ft minimum sidewalk on April Lane.		Off-Street Trails	
J	Create pedestrian path from Old Columbia Pike to April Lane.		Sideways	
K	Separated Bikeway (sidepath, east side) on Lockwood Drive from White Oak Park Drwy to New Hampshire Avenue		Separated Bike Lanes	6
L	Separated Bike Lanes (Two-Way, East Side) on Old Columbia Pike through White Oak Shopping Center	Montgomery County Bicycle Master Plan	Off-Street Trails	6
M	Off-street Trail from New Hampshire Avenue to FDA Boulevard, with spur connecting to Lockwood Drive	Montgomery County Bicycle Master Plan	Separated Bike Lanes	6
N	Extend bike lanes on Stewart Lane to Old Columbia Pike	Montgomery County Bicycle Master Plan	Sideways	6
O	Separated Bikeway (sidepath, east side) on Old Columbia Pike from White Oak Shopping Center to Tech Road	Montgomery County Bicycle Master Plan	Sideways	5, 6, 8
P	Separated Bikeway (sidepath, west side) on US 29 from Lockwood Drive to Tech Road	Montgomery County Bicycle Master Plan		
Q	Create pedestrian/ bike crossing of US 29 on Stewart Lane in the form of a sidepath from Old Columbia Pike to Milestone Drive	Montgomery County Bicycle Master Plan	Intersection Safety Improvements	6
R	Separated Bikeway (sidepath, west side) on Milestone Drive from Sherbrooke Woods Lane to Stewart Lane	Montgomery County Bicycle Master Plan	Sideways	6
S	Neighborhood Greenway / Shared Roadway on Sherbrooke Woods Lane from Milestone Drive to Heartfields Drive	Montgomery County Bicycle Master Plan	Shared Roadways	6

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. 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).
 - T Construct separated bikeway on Old Columbia Pike/ Prosperity Drive (sidepath) from Randolph Road to Stewart Lane.
 - U Construct separated bikeway (sidepath, west side) on Columbia Pike from Tech Road to Lockwood Drive.
 - V 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

Station 8 Map Key	Recommendation	Source	Category	Station Overlap
A	Improve pedestrian space by widening sidewalk and adding bus stop amenities such as shelter and bus arrival information.	Countywide Transit Corridors Functional Master Plan	Transit Facilities	
B	Improved pedestrian and bicycle accommodations on Columbia Pike crossing at Tech Road (pedestrian signals, crosswalks and raised refuge medians).	Countywide Transit Corridors Functional Master Plan	Intersection Safety Improvements	
C	Improve pedestrian crossing of Prosperity Drive, potentially combined with narrowing down Prosperity Drive.		Intersection Safety Improvements	
D	Improve pedestrian crossing of Tech Road by adding a Pedestrian Signal.		Intersection Safety Improvements	
E	Improve pedestrian space by widening sidewalk and adding bus stop amenities such as shelter and bus arrival information (potentially combining both stops).		Transit Facilities	
F	Create safe pedestrian crossing on Prosperity Drive and Industrial Parkway (pedestrian signal, refuge median and improved crosswalks).		Intersection Safety Improvements	
G	Expand Park and Ride, bringing the parking closer to BRT station by having a direct pedestrian connection to platform.		Transit Facilities	
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).	White Oak Science Gateway Master Plan	Roadway Modifications	
I	Improved pedestrian and bicycle accommodations on Columbia Pike and Old Columbia Road crossing at Industrial Parkway (pedestrian signals, crosswalks and raised refuge medians).	Countywide Bike Master Plan	Intersection Safety Improvements	
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).		Transit Facilities	
K	Implement street grid in White Oak Town Center plan with mixed use development.	KLNB Development Plan	Roadway Modifications	
L	Designate a portion of retail parking for transit users during weekday commute times.		Transit Facilities	
M	Coordinate with KLNB to install bike corral with repair services amenities in planned fitness area.		Bike Parking	
N	Add bicycle storage at Park and Ride.		Bike Parking	
O	Add trail connection between Cedar Hill Drive and Paint Branch Road.		Off-Street Trails	
P	Add sidewalk to Old Columbia Pike between Industrial Parkway and Stonehedge Park.		Sidewalks	
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.	Montgomery County Bicycle Master Plan	Sidepaths	
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).	Montgomery County Bicycle Master Plan and the White Oak Science Gateway Master Plan	Separated Bike Lanes	
S	Construct separated bikeway (two-way on both sides of street) on Industrial Parkway from Columbia Pike to FDA Boulevard.	Montgomery County Bicycle Master Plan	Separated Bike Lanes	
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).	Montgomery County Bicycle Master Plan and the White Oak Science Gateway Master Plan	Separated Bike Lanes	
U	Construct separated bikeway on Old Columbia Pike/ Prosperity Drive (sidepath) from Randolph Road to Stewart Lane.	Montgomery County Bicycle Master Plan	Separated Bike Lanes	6, 7
V	Construct separated bikeway (sidepath, west side) on Columbia Pike from Tech Road to Lockwood Drive.	Montgomery County Bicycle Master Plan	Sidepaths	4, 5, 6, 7
W	Construct separated bikeway (two-way, south side) on Cherry Hill Road from Columbia Pike to Gracefield Road.	Montgomery County Bicycle Master Plan	Separated Bike Lanes	
X	Construct separated bikeway (sidepath, west side) on Serpentine Way from Randolph Road to Fairland Road.	Montgomery County Bicycle Master Plan	Sidepaths	

Attachment G: Detailed Staff Comments

Page	Topic Area	Comment
3	Land Use	The land use summary is from 2010 and from the Maryland Department of Planning. This should instead pull from the Planning Department.
4	Analysis Approach	Where along the corridor was the select link analysis performed? Given the extent of the corridor, the location of this analysis would impact the results.
4	Travel Patterns	Why are the travel patterns described as vehicle trips and not person trips? Does this include travel by transit?
6	Transportation	Why are the number of total trips different in Table 1 and Table 2?
15	Land Use	These pages summarize relevant land use plans. It is not clear, however, how the land use plans support or do not support what the study is recommending.
17	White Oak LATR	Covers 2014 study, but not 2016 (revised 2019) white paper that includes cost estimation for specific intersection improvements at locations along the corridor (e.g. Stewart Lane, Tech Road).
18	Countywide Bike Master Plan	Attribution to MCDOT is incorrect. This is a Master Plan and was developed by the M-NCPPC, approved by the County Council acting as the District Commission, and adopted by the M-NCPPC.
19	Travel Volumes	How do pages 4 - 6 correspond with the travel volumes on page 19?
19	Analysis Approach	It is unclear how bus passengers that board and alight along the corridor counted. They should be captured under both bus passengers and pedestrians.
19	Existing Conditions	It's unclear which year "Existing Conditions" represents.
19	Travel Times	This statement on page 19 "Passenger vehicle travel times in the corridor from Tech Road to Georgia Avenue range from under 15 minutes in the off-peak direction to over 25 minutes in the peak direction. Express buses operate only in the peak directions with travel times no more than 5 minutes greater than those for passenger vehicles, while local buses operate in both directions with travel times approximately 10 minutes greater than those for passenger vehicles" doesn't seem to match the data in Figure 6 on page 20.

Page	Topic Area	Comment
19	Ped/Bike Volumes	Where do the pedestrian and bicycle numbers in Figure 5 come from?
20	Vissim	VISSIM should be used to model all scenarios. This is the best tool for BRT modeling. It is not clear if the median running alternative was modeled in VISSIM. If not, results could be misleading.
22	Breakdown Flow	Use of the term "breakdown flow" is inconsisent with how delay is defined in Table 4.
23	Failing Intersections	In Table 6, it would be helpful if the intersections at E or F included the seconds of delay to understand how close to the threshold these intersections are (also Table 14 on page 56)
24	Failing Intersections	Failing intersections in a CBD are not uncommon and should not always be mitigated to increase vehicle capacity because this comes at a cost to the walkability and safety in the CBD. As a result, a failing intersection in downtown Silver Spring, the Tech Road area in White Oak, and other "central areas" in the corridor should be considered for priority of walkability/safety over vehicle throughput.
25	Travel Times	In Table 8, we recommend including the length of each segment when reporting the travel time. This will allow the reader to infer speed and congestion.
28	Transit Conditions	Transit Conditions section should include a subsection summarizing MTA Commuter Bus service along the corridor.
30	Transit Conditions	In Table 10, does "stops/stations within corridor" reflect stops in both directions? The title is a bit confusing.
32	Transit Conditions	Round partial trips (decimal points).
34	Development	What future developments are being referenced and when are they anticipated to be complete (comment for all station areas).

Page	Topic Area	Comment
35	Bike/Ped	The pedestrian sections for the "central" areas such as Silver Spring, Tech Rd/White Oak needs more attention for the crossing conditions for pedestrians to the bus stops. For example, do the side streets to the corridor have "no turn on red" restrictions to improve safety, and if not, could that be considered? Do the intersections have adequate lighting? And lastly, do the intersections have adequate crossing times for pedestrians with lead pedestrian intervals where appropriate?
39	Bike/Ped	Franklin Avenue Sidewalks would be considered a pedestrian project, not a bicycle project
45	Bike/Ped	This should also acknowledge the trail along Michelson Road and its connection to the bike lanes on Lockwood Drive
49	Bike/Ped	Sidepath on US 29 is only planned for the north/west side of the street
55	Signal at Lanark Way	This signal was added primarily to provide access to the Northbound direction BRT station. How is this considered No-Build conditions? Was a warrant analysis conducted and the signal need determined to be warranted based on 2025 No-Build conditions?
60	Figure 15	Please provide reference to exact or rounded calculations, as the car and bus icon provide little definition. (Providing a number above each icon would help and not detract from the graphic).
62	Intersection Improvements	How does an additional southbound left-turn lane at Greencastle Road improve safety?
62	Intersection Improvements	How does widening Sligo Creek Parkway improve safety?
62	Intersection Improvements	Please include a brief summary of each criteria evaluated as part of the screening.
63	Parks	Auxiliary lane westbound on Sligo Creek will have significant Park impact and may not align with MNCPPC parkway management goals

Page	Topic Area	Comment
63	Master Plan	Functionally, it is odd that the managed lanes improvements do not line up particularly well with areas of greatest congestion – eg, there are no improvements between university Blvd and Burnt Mills, a key area of congestion in the AM; there are no improvements in downtown Silver Spring beyond Sligo Creek, an obvious area of high congestion and the heaviest transit use – it seems improvements here should be the first priority. Additionally, there is little attempt to investigate other intersection programming options, such as restricting left turn movements in peak hours to address congestion.
63	Master Plan	Include consideration of a bridge over Wayne Avenue - that links pedestrians and bicyclists to destinations
63	Master Plan	Per the Silver Spring CBD Plan-Consider operational improvements at signalized intersections, such as right-turn-on red prohibitions and exclusive pedestrian signal phasing to encourage pedestrian activity.
63	Master Plan Circulation Report	Prohibit PM peak period left turns from both Fenton Street approaches
66	Bike/Ped	Ped/Bike Improvement with specific projects should be broken out and provided a line item cost estimate. \$15-20 million for the entire corridor is a low number considering what is listed. Without a prioritization, it is unclear what bike/ped projects would be done first.
67	Signal Timing	Smart Signal timing, technologies with advanced signal communication should be prioritized over physical interchanges/widenings, which are more costly and reduce walkability in the corridor.
70	Analysis Approach	Was signal timing optimized in the 2025 Emerson Smoot and/or Managed Lanes scenarios?
74	Impacts	The study lacks a summary of impacts (e.g. environmental impacts, property relocation, historic preservation). A table similar to Tabel ES-3 in the 2017 study could be provided here for the evaluated alternatives.

Page	Topic Area	Comment
76	Analysis Approach	The proposed intersection improvements are not evaluated independently of the transit improvements, and similarly, the transit improvements are not evaluated independently of the intersection improvements. This reduces our ability to evaluate the independent merit of the different proposed improvements.
76	Analysis Approach	The study runs the regional model for No Action conditions to estimate vehicle volumes along the corridor. However, the model is not run for the Managed Lanes or Median BRT scenarios. As a result, it is assumed that vehicle volumes will be maintained across the transit scenarios (with the exception of an adjustment of 10% vehicle trips to HOV in the managed lanes scenario). It is anticipated that improved transit service (via dedicated or managed lanes) would lead to an increase in transit ridership and a decrease in vehicle demand. No accounting for this shift overestimates vehicle demand along the corridor.
79	Travel Times	In Figure 24, please show existing travel time for all directions and time periods.
89	Transportation	In the Managed Lanes alternative, why have operations improved in the off-peak direction on portions of the corridor with peak direction managed lanes? Shouldn't these conditions be the same as the No Action alternative?
89	Cost Estimation	We are trying to get a sense of how the various components of each build concept relate to costs. For example, from a travel time perspective, the benefit of transit-only lanes north of Stewart Ln seems limited, but the cost of the Managed Lane concepts is high (%40 million). It would be helpful if travel times are segmented based on how the Median Lane and Managed Lane concepts are segmented. (Median Lanes don't actually seem to be segmented but could be based on how the recommendations change). Additionally, please provide Figure 30 (travel time comparison) in a table for ease of comparing results.

Page	Topic Area	Comment
92	Managed Lane	"A managed lane from Blackburn Road to Fairland Road is not recommended, as the interchange construction at Blackburn Road, Greencastle Road, and Fairland Road necessitated by the managed lane would be more costly than the benefit the managed lane would provide." Why would a managed lane necessitate construction of three interchanges?
92	Parks	Any proposed work on Park land will require an extensive Concept Review and Park Construction Permit review and approval.
92	Master Plan	Other major concerns are the seeming great priority to provide vehicular intersection improvements – yes, they reduce overall travel time/ congestion, but at great cost. The managed lanes project in particular seems to be foremost an intersection improvement program with transit improvements a secondary by-product. We need to better balance ultimate intersection throughput / travel time reduction concerns against other priorities, namely vision zero and increasing overall comfort for walking/ biking. How does this plan address these concerns? Adding additional lanes seems to overall work against the overall efforts to meet set goals for those priorities and undermines the case for BRT in the first place. At best, these lane improvements add such great cost to the project that it seems ultimately infeasible.
92	Recommendations	Short-term recommendations include improvements at Burnt Mills Avenue, but improvements at this intersection were not proposed earlier in the study.
App1 1, App2 3	Traffic Volumes/Traffic Analysis	Is Ramsey Ave/Wayne Ave, Dixon Ave/Wayne Ave and others included in the analysis?? Volumes of various intersections were outlined in Appendix I, but don't seem to be included in the analysis (Appendix III). Why? Please provide some clarity. If other int
App2 2	Intersection Improvements	At Greencastle Road, the addition of the second southbound left-turn lane does not decrease left-turn delay. How is this improvement justified?
App2 2	Intersection Improvements	At Tech Road, the westbound right-turn lane does not appear to be included in either of the transit scenarios (or it has a negligible impact).

Page	Topic Area	Comment
App3	Bike/Ped	Where crosswalks are proposed, these should be specified as high-visibility crosswalks.
App3	Bike/Ped	Complete the cost estimates for bikeway / pedestrian projects using the cost estimate in the Bicycle Master Plan Fiscal Impact Statement. These were created by Andrew Bossi.
App3	Bike/Ped	It would be helpful to show existing conditions separately from the proposed improvements to better understand the existing gaps.
App3	Bike/Ped	Sidewalks within the watershed are missing. For example, on page 2, existing sidewalks are not included along Georgia Avenue south of Spring Street, on Spring Street between 16th Street and 2nd Avenue, and Colesville Road between Georgia Avenue and Fenton Street. It may warrant checking the entire area for other missed sidewalks.
App3 16	Parks	Parks supports recommendation I and B to improve crossings of US 29 and recommendation U for bicycle improvements on Old Columbia Road.
App3 16	Parks	Parks will need more information on the trail connection in Rec. O - What is Paint branch Rd that is referred to? Natural resource impacts will need to be assessed.
App3 16	Parks	This trail connection in recommendation O makes conceptual sense. The Parks Trails Section is installing a bridge over the Paint Branch in the next several months to make the natural surface trail connection under US29 to the parkland on the southeast side. This bridge will help make this project more feasible.
App3 8	Parks	A sidewalk project is in design on northwest side of US29. Negotiations underway regarding historical preservation to avoid routing pedestrians through parking lot.
App3 8	Parks	Parks director has received complaints about safety at the trail crossing of US29 at Burnt Mills. Priority for Parks.
App3 8	Parks	Parks supports bridge over northwest branch (location B) pending review by natural resources staff. Flooding at Burnt Mills Reservoir has been a significant safety issue.

Page	Topic Area	Comment
App3 8	Parks	Sidewalk on bridge over Northwest Branch needs separation from motor vehicle traffic. Current sidewalk is uncomfortable and possibly unsafe.
Scope 10	Analysis Approach	Item 3B in the scope includes recommendations to improve Alternatives A, B and Emerson Smoot concepts, but these are not provided in the study. Instead, it appears the Emerson Smoot concept was evaluated at face value, rather tweaked to optimize operations.
Scope 8	Analysis Approach	Scope notes that roadway operational improvements would be considered independently of the BRT transit project, yet they are not evaluated independently. It states intersection improvements would be assessed with and without managed lanes.