Appendix J

Alternatives Evaluation

This appendix summarizes alternatives evaluation results based on various Measures of Effectiveness (MOEs). Measures of Effectiveness (MOEs) identified for this study based on the BRT program-wide goals.

Measures of Effectiveness (MOEs)

Measures of effectiveness (MOEs) are criteria used to systematically evaluate the performance of alternatives in meeting the project's goals and objectives. The No-Build alternative and each end-to-end alternative design for the proposed New Hampshire Avenue Flash Bus Rapid Transit (BRT) service was evaluated using MOEs that correspond to the six program-wide goals, established by MCDOT, for implementing and operating the Flash BRT system consistently across the various corridors. These goals provided the framework for development of the following project objectives:

- **Goal #1: Mobility Choices**
  - Maximize the number of jobs accessible by transit
  - Increase connection between study corridor and regional job opportunities
  - Provide pedestrian and bicycle infrastructure to access stations
- **Goal #2: Sustainable Solutions**
  - Minimize needed ROW expansions
  - Minimize effects to the built and natural environments
  - Develop cost effective alternatives that are competitive against peer projects
  - Develop alternatives that can be implemented and constructed efficiently
- **Goal #3: Corridor Safety**
  - Improve the safety of corridor for all road users and make progress toward the County's Vision Zero Plan
- **Goal #4: Economic Growth**
  - Support planned and potential new development along the corridor
- **Goal #5: Quality Service**
  - Improve the speed and reliability of transit service in the corridor
  - Provide high frequency transit within the study area
  - Provide connections to high frequency and regional transit services
- **Goal #6: Community Equity**
  - Effectively serve equity and disadvantaged communities in the corridor

These project objectives were then used to develop qualitative and quantitative MOEs to analyze alternatives and substantiate the Project's purpose and need. MOEs were categorized into two classes: Primary MOEs and Secondary MOEs. The Primary MOEs included quantitative metrics that produced separate results for the No-Build and each build alternatives. The following Primary MOEs were used to compare corridor-wide end-to-end BRT alternatives.

Primary MOEs

- Travel time for Flash BRT, local bus, and general traffic
- Property impacts and ROW needs for roadway and stormwater infrastructure
- Estimated total capital costs for construction, design, and new buses
- Total capital cost per mile
- BRT transit ridership

The Secondary MOEs produced the same results when calculated for the No-Build and each of the build alternatives, as all alternatives followed a common route alignment and had the same station locations. The calculations for the Secondary MOEs were based on the underlying data, such as U.S. Census demographic data, which remained constant for each alternative. The following Secondary MOEs were used to strengthen the overall case for the Project.

Secondary MOEs

- Transit Accessibility to Jobs - Number of jobs within a half-mile of stations
- Pedestrian Level of Comfort (LOC) within a half-mile of station
- Bicycle Level of Traffic Stress (LTS) within a half-mile of station
- Pedestrian LOC for New Hampshire Avenue Study Corridor
- Bicycle LTS for New Hampshire Avenue Study Corridor
- Acreage of transit-supportive future land use within a half-mile of station areas
- Acreage of vacant and underutilized parcels within a half-mile of station areas
- Proximity to sensitive receptors and environmental resources
- Potential construction duration
- Inclusion of safe and appropriate traffic safety treatments
- Bus and vehicle delay
- Frequency of peak-period BRT service
- Frequency of BRT service in midday and other off-peak times
- Number of connections to high-quality transit service
- Equity population within a half-mile of stations
- Number of zero- or one-vehicle households served

Evaluation Methodology

The No-Build and build alternatives were rated against each MOE related to travel time, transit. Detailed analyses were conducted using the following tools and methodologies to calculate results for various MOEs for all alternatives:

- Detailed traffic operations analysis was conducted using an advanced multi-modal microsimulation modelling software called PTV VISSIM. This analysis was used to calculate travel times for BRT, local, bus, and general traffic. Additional details related to traffic analysis are included in **Appendix E** and **Appendix F**.
- The Federal Transit Administration's (FTA) standardized ridership forecasting tool called Simplified Trips-on-Project Software (STOPS) was used to calculate transit ridership. STOPS uses census, employment, and transit service data to calculate transit ridership forecasts. Additional details related to STOPS modeling are included in **Appendix I**.
- Geographic Information System (GIS) analysis was conducted using ESRI's ArcGIS software platform. GIS analysis used transit travel time data to calculate accessibility to jobs.
- MicroStation, a Computer-Aided Design (CAD) software, was used to develop conceptual designs to assist in calculating costs and ROW requirements. Conceptual plans for initial alternatives and for the Hybrid Alternative are included in **Appendix G** and **Appendix H**, respectively.

Alternatives are rated against each MOE are given a ranking using a consistent scale (Good, Fair, Poor), as described in **Table 1**. It is important to note that these ratings are not an assessment in absolute terms on the merits of each alternative but rather to serve as a tool in evaluating the differences between alternatives in achieving Flash BRT Program goals. A "Good" rating will indicate favorable qualities, in comparison to each alternative respectively, that perform well in achieving Flash BRT Program goals (e.g., shorter travel time, lower cost), while a "Poor" rating will indicate less favorable qualities and a lesser ability to achieve BRT program goals (e.g., longer travel time, higher cost), and a "Fair" rating will fall in between. Evaluation results for each MOE are described respectively in this appendix, whereas a summary matrix depicting evaluation results for all MOEs can be found on page 17.

Table 1: MOE Evaluation Scoring System

Rating	Symbol	Description
Good	●	Flash BRT goals are well achieved in alternative
Fair	◐	Flash BRT goals are somewhat achieved in alternative
Poor	○	Flash BRT goals are not well achieved in alternative

Evaluation Results

The following section defines each MOE used to evaluate the BRT alternative designs and summarizes the results of the evaluation analysis, including the Hybrid Alternative. Each MOE corresponds to overall Flash BRT Program and study goals and objectives in order to evaluate the effectiveness of an alternative in achieving the defined goals and objectives as described below in this section.

Evaluation Results for Primary MOEs

Travel Time

BRT, local bus, and general traffic travel times were calculated based on VISSIM microsimulation traffic modeling. The microsimulation modeling was conducted for part of the corridor from Sheridan Street, just north of Eastern Avenue, to Mahan Road, at the entrance to the FDA campus just south of Lockwood Drive (see **Appendix F** and **Appendix G** for detailed information existing and future traffic analysis results). **Table 2** compares travel time between all alternatives for BRT, local bus, and general traffic. The travel time numbers represent peak period commute round trip in minutes (AM Southbound + PM Northbound) between Sheridan Street and Mahan Road (5 miles one-way).

Table 2: Travel Time Comparison (Round Trip in Minutes)

Mode	No Build	Alt 1 - Mixed Traffic	Alt 2 - Curb Lanes	Alt 3 - Median Lanes	Alt 4 - Additional Median Lanes	Hybrid Alternative
BRT	N/A	47.3	43.1	36.4	36.3	33.4
Local Bus	62.6	47.0	43.2	64.7	67.5	38.2
General Traffic	48.0	31.3	45.7	47.5	50.2	39.9

Cost-per-minute of Travel Time Savings

Cost savings per minute of travel time is defined as the travel time savings provided by each alternative in relation to the Total Capital Cost of each alternative. Cost-per-minute of Travel Time Savings is calculated by dividing the Total Capital Cost (shown in **Table 3**) by the Travel Time Savings of each BRT alternative (in Minutes) as compared to the No Build to quantify a cost savings in 2023 dollars. Lowest cost-per-minute of travel time by each travel mode is assigned a rating of **Good** as it performs most favorable or has the highest effectiveness for this MOE.

Table 3: Cost-per-minute of Travel Time Savings (2023 $ in Millions)

Mode	Alt 1 - Mixed Traffic	Alt 2 - Curb Lanes	Alt 3 - Median Lanes	Alt 4 - Additional Median lanes	Hybrid Alternative
BRT	$7.8	$5.6	$17.4	$16.8	$4.5
Local Bus	$7.7	$5.6	N/A[1]	N/A[1]	$5.6
General Traffic	$7.2	$47.4	N/A[1]	N/A[1]	$17.2

Note[1]: Savings cannot be quantified as travel time is not reduced for these modes.

Potential Right-of-Way (ROW) Required

The potential ROW required was calculated based on conceptual design layouts for each alternative. ROW calculations include ROW for roadway widening and stormwater requirements. **Table 4** shows the potential ROW required for each alternative. Alternative 2 requires the least amount of additional ROW since it repurposes existing lanes and does not include any queue jumps requiring intersection reconstruction. Hybrid Alternative requires the least ROW after Alternative 2.

Table 4: Potential Total ROW Required in Acres

Analysis Scenario	Alt 1 - Mixed Traffic	Alt 2 - Curb Lanes	Alt 3 - Median Lanes	Alt 4 - Additional Median lanes	Hybrid Alternative
Stormwater	2.4	0.8	20	17.9	2.3
Roadway Widening	1.8	0.9	6.1	6.1	1.7
Total ROW	4.2	1.7	26.1	24.0	4.0

Potential Total Capital Costs and Costs per Mile

Potential total capital costs were developed based on preliminary design layouts for each alternative. **Table 5** and **Figure 1** show the potential total costs. The total capital costs include construction, design, overhead, and rolling stock costs for BRT buses. Alternative 2 is the lowest-cost alternative since it repurposes existing lanes and does not include any queue jumps requiring intersection reconstruction or local bus pull-outs. Alternatives 3 and 4 with median lanes are three to four times more expensive than Alternative 2 and the Hybrid

Alternative. The Hybrid Alternative costs an additional $33.1 million as compared to Alternative 2 due to the additional length of curbside lanes, queue jumps, and added local bus pull-outs.

Table 5: Potential Total Capital Costs (2023 $ in Millions)

Analysis Scenario	Alt 1 - Mixed Traffic	Alt 2 - Curb Lanes	Alt 3 - Median Lanes	Alt 4 - Additional Median lanes	Hybrid Alternative
Total Construction, Design, and Overhead Cost	$87.5	$79.0	$425.7	$411.0	$114.1
Rollingstock Cost	$32.0	$30.0	$30.0	$30.0	$28.0
Total	$119.5	$109.0	$455.7	$441.0	$142.1
Total Capital Cost Per Mile	$14.3	$13.1	$54.7	$52.9	$17.1

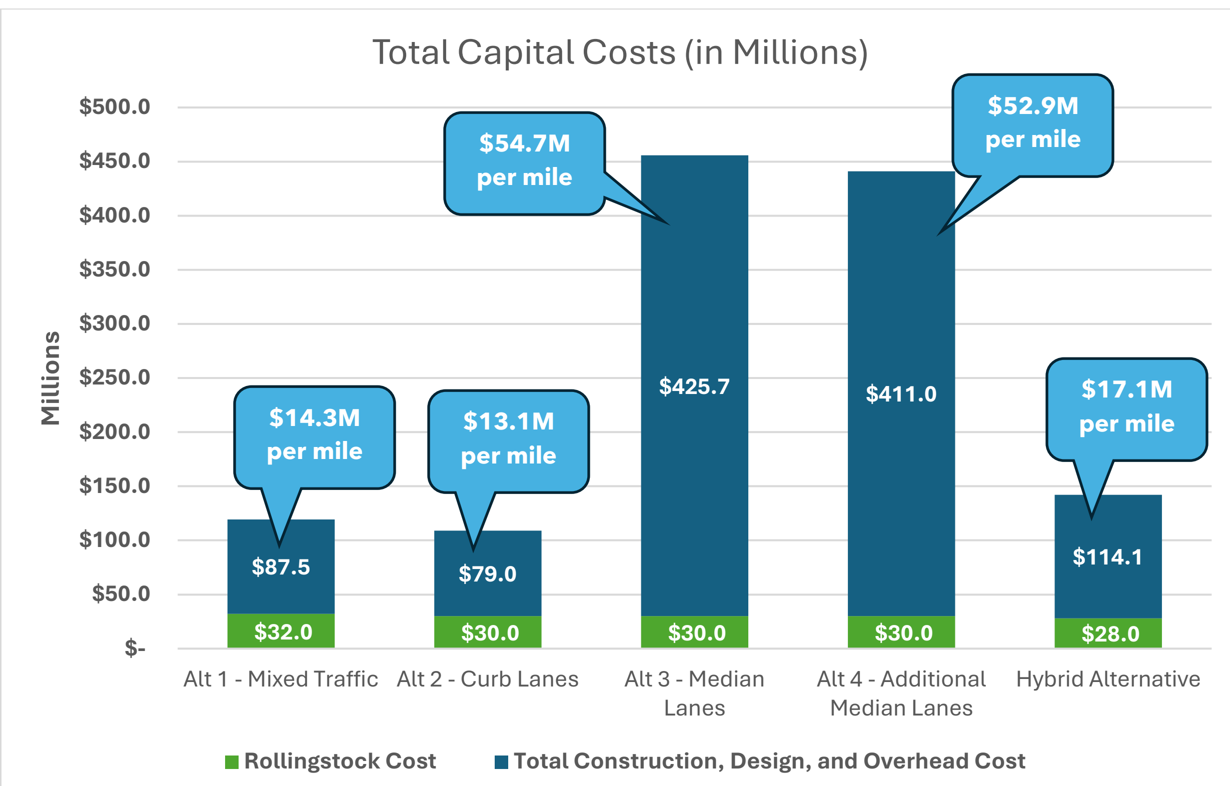

Figure 1: Total Capital Cost (2023 $ in Millions)

BRT Ridership

Shown in **Table 6** are total transit boardings (i.e., unlinked trips[1]) for each BRT alternative as well as existing bus routes operating within the New Hampshire Avenue corridor for the year 2045. Ridership forecast numbers for 2045 are developed using the Federal Transit Administration's (FTA) Simplified Trips-on-Project Software (STOPS) model. STOPS is a standalone ridership model created by FTA specifically for evaluating Capital Investment Grant (CIG)[2] candidate transit projects. STOPS produces base year average weekday ridership forecasts for CIG mobility, congestion relief, and cost effectiveness measures; and quantifies the projected change in daily automobile Person Miles Traveled (PMT) resulting from implementation of the proposed project, which is used for the CIG environmental benefits measure. STOPS has been calibrated and validated using actual ridership experience on transitways including BRT, Light Rail Transit (LRT), and commuter rail across the country.

During the model development phase, it was determined that recently collected survey data characterizing transit demand was not available; consequently, the STOPS model was employed in its synthetic mode. The STOPS methodology synthesized total trip-making based on schedule data from the region's transit providers' general transit feed specification (GTFS) files and travel demand information sourced from the Census Transportation Planning Package (CTPP) for the years 2012 to 2016. Initial ridership estimates by route and stop location were compared to actual counts from 2019, and the model was subsequently calibrated to align with the ridership patterns observed during that period. Following this calibration, the model was updated using contemporaneous count data reflecting 2024 transit ridership in the region to forecast base and future year project ridership. This approach adheres to FTA guidance for developing synthetic mode STOPS applications, utilizing pre-pandemic demand information (2012-2016 CTPP) to inform post-pandemic ridership scenarios.[3]

Transit boardings increase significantly from 2024 to 2045 across all alternatives, with the Hybrid Alternative consistently yielding the highest ridership (8,200 in 2024 and 11,000 in 2045). Therefore, a rating of **Good** was assigned to the Hybrid Alternative for this MOE as it has the most effectiveness in terms of ridership.

Compared to the no build alternative, boardings on non-project routes decline. This indicates that implementation of New Hampshire Avenue BRT primarily shifts demand away from certain existing services. The total ridership in the corridor (BRT + Ride On and WMATA bus ridership) increases only modestly under each alternative compared to the no-build. Overall, **Table 6** suggests that while the BRT boosts total corridor ridership, it also redistributes some trips from

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[1] Unlinked trips refer to the number of passengers who board transit vehicles. Passengers are counted each time they board vehicles no matter how many vehicles they use to travel from their origin to their destination.
[2] FTA Capital Investment Grant Program (transit.dot.gov)
[3] AASHTO Census Transportation Planning Products (transportation.org)

legacy routes. Refer to Ridership Memo in **Appendix I** for further details of ridership forecast results and methodology.

Table 6: Weekday BRT Ridership Comparison (2045 Unlinked Trips)

Mode	No Build	Alt 1 - Mixed Traffic	Alt 2 - Curb Lanes	Alt 3 - Median Lanes	Alt 4 - Additional Median Lanes	Hybrid Alternative
BRT	N/A	7,720	8,168	9,210	9,181	10,973
Montgomery County Transit - Ride On Bus Routes						
Route 10	4,515	4,305	4,361	4,492	4,389	4,943
Route 16	2,080	1,633	1,625	1,614	1,610	1,557
Route 20	1,375	1,152	1,293	1,136	1,137	1,363
Route 21	141	106	113	107	107	101
Route 22	234	223	221	229	229	213
Route 24	154	68	146	66	66	66
WMATA – Metrobus Routes						
Route Z2	415	319	355	320	321	305
Route C8	3,417	3,147	3,214	3,102	3,107	3,107
Route K6	10,409	7,841	6,658	6,745	6,730	6,102
Route K9	1,512	-	-	-	-	-
Subtotal (Local Bus)	*24,252*	*18,794*	*17,986*	*17,811*	*17,696*	*17,757*
Total (with BRT)	**24,252**	**26,514**	**26,154**	**27,021**	**26,877**	**28,730**

Evaluation results for the Primary MOEs, including total capital costs, are illustrated in **Table 7**.

Table 7: Summary of Alternatives Evaluation for Primary MOEs

Measures of Effectiveness (MOEs)	No-Build	Alt 1 Mixed Traffic	Alt 2 Curb Lanes	Alt 3 Median Lanes	Alt 4 Additional Median Lanes	Hybrid Alt
Flash BRT Travel Time	N/A	47.3 min.	43.1 min.	36.4 min.	36.3 min.	33.4 min.
Local Bus Travel Time	62.6 min.	47.0 min.	43.2 min.	64.7 min.	67.5 min.	38.2 min.
Traffic Travel Time	48.0 min.	31.3 min.	45.7 min.	47.5 min.	50.2 min.	39.9 min.
ROW Requirement	N/A	4.2 acres	1.7 acres	26.1 acres	24.0 acres	4.0 acres
Total Capital Cost	N/A	$119.5 Mil.	$109.0 Mil.	$455.7 Mil.	$441.0 Mil.	$142.1 Mil.
Cost/Mile	N/A	$14.3 Mil.	$13.1 Mil.	$54.7 Mil.	$52.9 Mil.	$17.1 Mil.
2045 Weekday New Hampshire Ave BRT Ridership	N/A	7,720	8,168	9,210	9,181	10,973

Evaluation Results for Secondary MOEs

Transit Accessibility to Jobs – Number of Jobs within a Half-Mile of Stations

Transit access to jobs was calculated using 2023 LEHD data (based on the US Census and Bureau of Labor Statistics) and by conducting GIS analysis using an online data analysis platform named Remix. According to LEHD data there are a total of 12,282 jobs within ½ mile of the proposed BRT stations in each alternative. The following three different scenarios were analyzed:

- Number of jobs for study area residents based on 45-minute no-transfer transit trip
- Number of jobs for study area residents based on a single-transfer transit trip
- Study area jobs based on a single-transfer transit trip

Table 8 shows the results of this analysis. Compared to the no-build condition, the Hybrid Alternative increases transit access to jobs by 11% to 25%, depending on the analysis scenario. The greatest increase is seen in the Hybrid Alternative since local bus and BRT speeds are highest in this alternative.

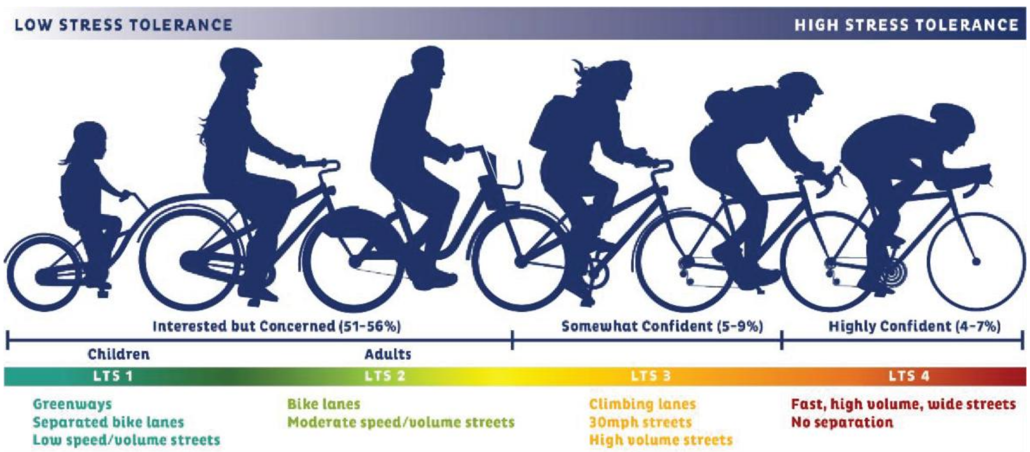
Table 8: Transit Accessibility to Jobs

Analysis Scenario	No Build	Alt 1 - Mixed Traffic	Alt 2 - Curb Lanes	Alt 3 - Median Lanes	Alt 4 - Additional Median lanes	Hybrid Alternative
Number of jobs for study area residents based on 45-minute no-transfer transit trip	214,959	217,715	231,567	246,391	244,744	271,138
Number of jobs for study area residents based on a single-transfer transit trip	413,916	425,653	445,404	452,428	452,888	461,395
Study area jobs based on a single-transfer transit trip	234,516	248,606	262,332	270,818	270,888	287,865

Bicycle and Pedestrian Accessibility and Comfort

Bicycle and pedestrian accessibility and comfort were analyzed for both all streets within ½ mile of stations and for New Hampshire Avenue.

Bicycle accessibility and comfort was calculated using the Bicycle Level of Traffic Stress (LTS) methodology with data provided by the Montgomery County Planning Department. **Figure 2** depicts a typical LTS scale. The LTS methodology assigns a numeric stress level to bicycle facilities based on attributes such as traffic speed, volume, number of lanes, rate of parking turnover, ease of use, and others.[4]



Source: Mid-Ohio Regional Planning Commission

Figure 2: Bicycle Level of Traffic Stress (LTS) Scale Example

Pedestrian accessibility and comfort were calculated using the Pedestrian Level of Comfort (PLOC) methodology with data provided by the Montgomery County Planning Department. A variety of factors are considered to determine a numeric PLOC score for each pedestrian crossing and pathway segment.[5]

PLOC comfort level scale:

1 = Very Comfortable

2 = Comfortable

3 = Somewhat Uncomfortable

4 = Uncomfortable

5 = Undesirable

Each alternative is evaluated for effectiveness by the length weighted average for each MOE listed in **Table 9**.

[4] Montgomery County Bicycle Master Plan Appendix D
[5] Appendix A: Pedestrian Level of Comfort Methodology

Table 9: Bicycle and Pedestrian Accessibility and Comfort (PLOC and LTS Scores)

Analysis Scenario	Alt 1 - Mixed Traffic	Alt 2 - Curb Lanes	Alt 3 - Median Lanes	Alt 4 - Additional Median lanes	Hybrid Alternative
Pedestrian Level of Comfort (PLOC) within ½ mile of stations	2.5	2.5	2.5	2.5	2.5
Bicycle Level of Traffic Stress (LTS) within ½ mile of stations	1.5	1.5	1.5	1.5	1.5
Pedestrian Level of Comfort (PLOC) on New Hampshire Avenue	3.6	3.6	3.6	3.6	3.6
Bicycle Level of Traffic Stress (LTS) on New Hampshire Avenue	3.8	3.8	3.8	3.8	3.8

Acreage of Transit Supportive Land Uses and Vacant Parcels

Total acreage of transit supportive future land uses within ½ mile of station areas as well as total acreage of vacant and underutilized parcels were calculated in GIS using data provided by the Montgomery County and Prince George's County Planning Departments. Shown in **Figure 3**, proposed BRT stations in each alternative are within ½ mile of substantial transit supportive land uses and/or vacant and underutilized parcels. For context, 1,701 acres represents about one-third the size of Annapolis, Maryland whereas 1,132 acres represents one-fourth. Each alternative received a ranking of **Good**, as they each have equally high effectiveness for these MOEs.

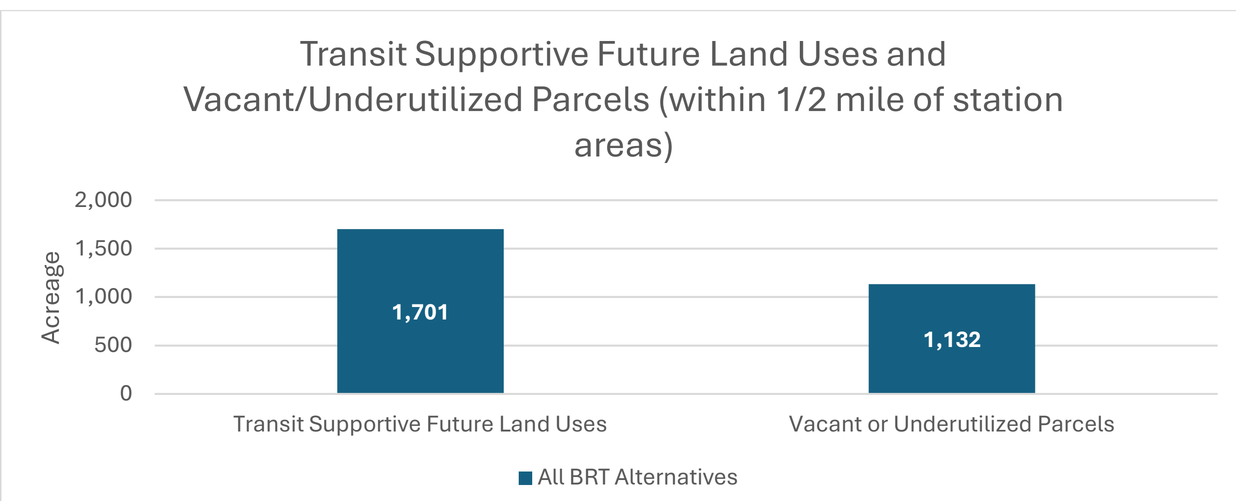


Figure 3: Transit Supportive Land Uses & Vacant Parcels within 1/2 Mile (in Acres)

Proximity to Sensitive Receptors and Environmental Resources

Proximity to Sensitive Receptors (i.e., schools and hospitals) and Environmental Resources (i.e., floodplains, wetlands, historic resources, parks and open space, and remediation or hazardous materials sites) was calculated by using available GIS data. The following number of sites were identified within ¼ mile of the study area corridor:

- Sensitive Receptors
  - Schools = 3
  - Hospitals = 1
- Floodplain = 5
- Wetlands = 25
- Historic Resources = 0
- Parks and Open Space = 22
- Brownfield/Superfund Sites = 1

The number of sites in this MOE are the same across all alternatives. Therefore, a rating of **Fair** was assigned equally.

Potential Construction Duration

Potential construction duration, shown in **Table 10**, was estimated based on conceptual design layouts and analysis of similar projects. The qualitative assessment suggests that Alternatives 1, 2, and the Hybrid Alternative will take about 2 to 3 years of construction, whereas Alternatives 3 and 4 may take up to 4 or 5 years of total construction. The additional time required for Alternatives 3 and 4 is due to additional roadway reconstruction to implement median bus lanes along the corridor.

Table 10: Potential Construction Duration

Analysis Scenario	Alt 1 - Mixed Traffic	Alt 2 - Curb Lanes	Alt 3 - Median Lanes	Alt 4 - Additional Median lanes	Hybrid Alternative
Potential Construction Duration	2-3 Years	2-3 Years	4-5 Years	4-5 Years	2-3 Years

Inclusion of Safe and Appropriate Traffic Safety Treatments

Utilizing the preliminary design plans, a qualitative assessment of the inclusion of safe and appropriate bicycle and pedestrian facilities and intersection treatments was completed for each alternative (**Table 11**). This assessment focused on design treatments at signalized intersections. While Alternatives 3 and 4 have the largest impacts and require roadway reconstruction to implement median bus lanes along the entire corridor (segments 1 – 5), this reconfiguration provides the opportunity for pedestrian refuge islands and crosswalk improvements at all signalized intersections reducing pedestrian exposure to traffic and increasing comfort.

Table 11: Inclusion of Safe and Appropriate Traffic Safety Treatments (Qualitative)

Analysis Scenario	Alt 1 - Mixed Traffic	Alt 2 - Curb Lanes	Alt 3 - Median Lanes	Alt 4 - Additional Median lanes	Hybrid Alternative
Crosswalk improvements at all impacted signalized intersections (full corridor)	N/A	N/A	Yes	Yes	N/A
Pedestrian refuge islands at all signalized intersections	N/A	N/A	Yes	Yes	N/A
Crosswalk improvements at all impacted signalized intersections (segments 1 – 4)	Yes	Yes	N/A	N/A	Yes

Bus and Vehicle Delay

BRT, local bus, and general traffic delay shown in **Figure 4** were calculated based on VISSIM microsimulation traffic modeling for average delay during AM and PM peak travel hours. BRT bus service in Alternative 1 (Mixed Traffic) experienced the greatest average delay at 13.8 minutes or 826.9 seconds (see **Table 12**). Whereas local bus and general traffic experienced the highest average delays in Alternative 4 (Additional Median Lanes). The Hybrid Alternative performed most favorably with the lowest average delay for all modes of travel in this MOE.

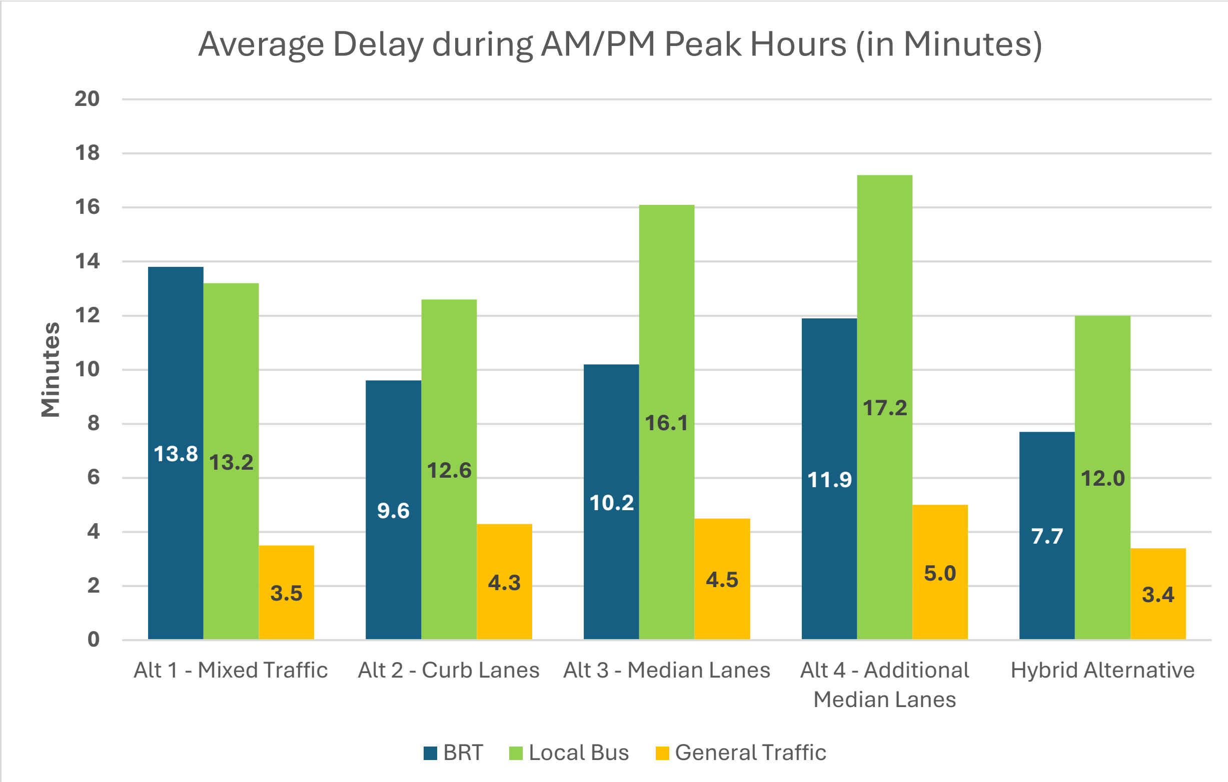


Figure 4: Average Bus and Vehicle Delay (in Minutes)

Table 12: Average Bus and Vehicle Delay (in Seconds)

Mode	Alt 1 - Mixed Traffic	Alt 2 - Curb Lanes	Alt 3 - Median Lanes	Alt 4 - Additional Median lanes	Hybrid Alternative
BRT	826.9	575.3	614.7	713.9	463.9
Local Bus	791.5	753.6	967.4	1034.9	718.6
General Traffic	212.7	259.8	270.5	304.0	205.0

BRT Service Frequencies

An evaluation of the anticipated frequency of BRT service on New Hampshire Avenue was conducted for both the AM/PM peak periods and the mid-day and other off-peak times (**Table 13**). Frequency of service data was provided by MCDOT. BRT service on New Hampshire Avenue is anticipated to operate on the same headways across each alternative and are as follows:

Table 13: BRT Service Spans and Headways

AM Peak	PM Peak	Service Span	Headway (Peak)	Headway (Off-Peak)
5:15 – 8:30 AM	3:15 – 7:15 PM	5:00 AM – 12:25 AM	8 minutes	15 minutes

Number of Connections to High Quality Transit Service

Proposed New Hampshire Avenue BRT service interfaces with numerous existing and planned transit services. An evaluation of the number of connections to high quality transit services was completed. High quality transit services refer to transit networks that offer frequent and reliable service, often with dedicated infrastructure and frequent stops. The evaluation identified proposed BRT connections to the following six (6) high quality transit services:

MCDOT

- US 29 Flash BRT
- Randolph Road Flash BRT (future planned route)

MTA

- Purple Line Light Rail at University Boulevard (anticipated to begin service in 2027)

WMATA Metrorail at Fort Totten

- Red Line
- Green Line
- Yellow Line

By adding BRT service to the corridor, New Hampshire Avenue will have increased and more reliable connections to high quality transit service, providing the public more transit options. Due to the connectivity of BRT service to multiple high quality transit services a rating of **Good** was assigned to this MOE.

Equity Populations

An evaluation of equity populations within ½ mile of stations and number of zero or one-vehicle households served by the proposed BRT service was completed. The term equity populations refer to persons that fall within an equity area as defined by MWCOG or Montgomery County. The results for this MOE are represented by a total number of persons of equity populations and households served that identify as having access to one-vehicle or less. The American Community Survey (ACS) 2019 5-year Estimates from the US Census Bureau data was utilized to complete the evaluation. Approximately two-thirds of the study corridor falls within an equity area as identified by Montgomery County or the Metropolitan Washington Council of Governments (MWCOG). The results of this evaluation are the same for each alternative and show that BRT implementation would well achieve the goal of equitably serving communities in the New Hampshire Avenue corridor by increasing access to faster and more reliable transit. Therefore, a rating of **Good** was assigned to this MOE.

- Equity populations = 69,719 people
- Zero or one-vehicle households served by BRT = 3,083 households

Final Overall Alternatives Rating

Each alternative was screened against the 33 MOEs described above. The total rating score shown in **Table 14** is calculated by evaluating the overall effectiveness of each alternative in achieving Flash BRT Program goals through MOEs. Ratings of Good (●), Fair (◐), and Poor (○) was assigned to each MOE evaluation result and were tailed for each alternative, across MOEs to arrive at an overall total rating (see **Table 1** for Evaluation Methodology for further description of ratings). A matrix, provided on the next page, was also prepared to illustrate the ratings assigned for each individual MOE.

Table 14: Evaluation of Alternatives Total Rating Score

Alternative	Total Rating
Alternative 1 - Mixed Traffic with Queue Jumps	**Fair**
Alternative 2 - Curbside Lanes	**Fair**
Alternative 3 - Median Lanes	**Poor**
Alternative 4 - Additional Median Lanes	**Poor**
Hybrid Alternative	**Good**

Alternatives Screening Matrix

New Hampshire Avenue BRT Study Alternatives Screening Matrix					
Measure of Effectiveness (MOE)	**Alternative 1: Mixed Traffic**	**Alternative 2: Curbside Lanes**	**Alternative 3: Median Lanes**	**Alternative 4: Additional Median Lanes**	**Hybrid Alternative**
Jobs within census block groups within a half mile of stations	◐	◐	◐	◐	◐
Number of jobs available within a 45-minute transit travel time	○	◐	◐	◐	●
Number of jobs accessible to study area residents with a single-transfer transit trip	○	◐	◐	◐	●
Number of potential workers with access to study area job centers with a single-transfer transit trip	○	◐	◐	◐	●
Pedestrian Level of Comfort (PLOC) within ½ mile of stations	◐	◐	◐	◐	◐
Bicycle Level of Traffic Stress (LTS) within ½ mile of stations	●	●	●	●	●
Pedestrian Level of Comfort (PLOC) for New Hampshire Avenue	○	○	○	○	○
Bicycle Level of Traffic Stress (LTS) for New Hampshire Avenue	○	○	○	○	○
Potential right-of-way (ROW) required	●	●	○	○	●
Proximity to sensitive receptors	◐	◐	◐	◐	◐
Proximity to environmental resources	◐	◐	◐	◐	◐
Projected changes to stormwater	●	●	○	○	●
Total capital cost per mile	●	●	○	○	●
Potential construction duration	●	●	◐	◐	●
Inclusion of safe and appropriate bicycle and pedestrian facilities and intersection treatments	◐	◐	●	●	◐
Acreage of transit supportive future land use within ½ mile of station areas	●	●	●	●	●
Acreage of vacant and underutilized parcels within ½ mile of station areas	●	●	●	●	●
BRT transit travel time	○	○	◐	◐	●
Cost Per Minute of BRT Travel Time Savings	◐	◐	○	○	●
Local bus transit travel time	◐	◐	○	○	●
Cost Per Minute of Local Bus Travel Time Savings	◐	●	○	○	●
General traffic travel time	●	◐	◐	○	◐
Cost Per Minute of General Traffic Travel Time Savings	●	○	○	○	○
Vehicle delay	●	◐	○	○	●
BRT transit delay	○	◐	○	○	●
Local bus transit delay	◐	◐	○	○	●
BRT ridership	○	○	◐	◐	●
Frequency of peak period BRT service	●	●	●	●	●
Frequency of BRT service in mid-day and other off-peak times	●	●	●	●	●
Number of connections to high quality transit service	●	●	●	●	●
Equity population within ½ mile of stations	●	●	●	●	●
Number of zero or one-vehicle households served	●	●	●	●	●
Score	**Fair**	**Fair**	**Poor**	**Poor**	**Good**

Key Takeaways

Ultimately, the alternatives analysis process, evaluation results, and input from project stakeholders identified the Hybrid Alternative as the Preferred Alternative to advance towards implementation for the proposed New Hampshire Avenue Flash BRT service as it outperforms all other alternatives in meeting the study's purpose, needs, goals, and objectives.

Most notably, the Hybrid Alternative offers the shortest transit travel time of the other alternatives, has minimal impact to motorists, at the lowest cost-per-minute of travel time in relation to its total capital cost. The Hybrid Alternative was also found to yield the highest ridership.