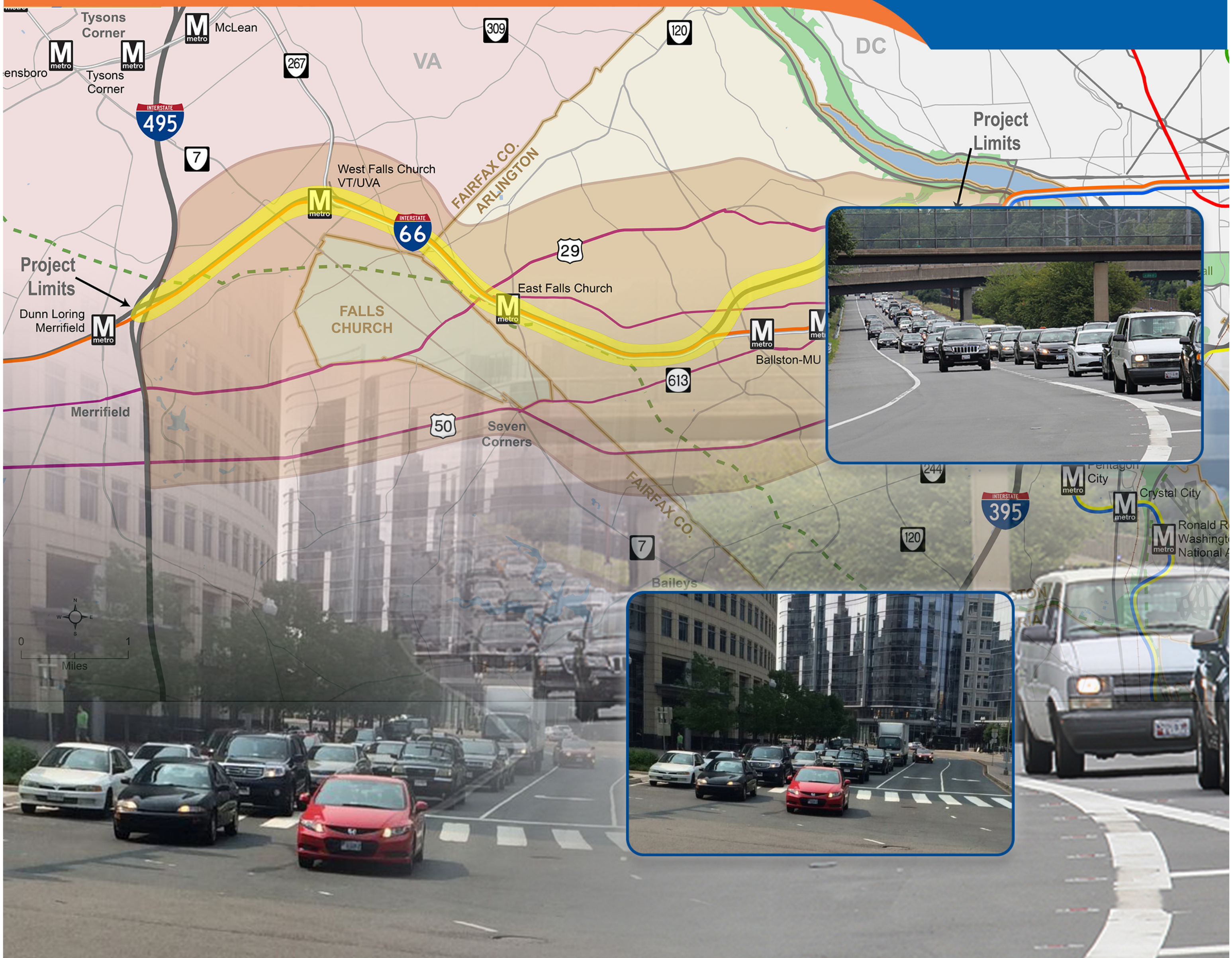
I-66 Multimodal Improvements

TRANSFORM 66
INSIDE the Beltway
VDOT | DRPT
Investing in Multimodal Solutions

Future Conditions Traffic Technical Memorandum



October 2, 2015

Prepared for

VDOT

Prepared by

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PRELIMINARY FUTURE CONDITIONS TECHNICAL MEMORANDUM

I-66 INSIDE THE BELTWAY DYNAMICALLY PRICED TOLL LANES

From: I-495 (Capital Beltway) in Fairfax County

To: US 29 (Lee Highway – Spout Run) in Arlington County

October 2, 2015

1. INTRODUCTION

The Virginia Department of Transportation (VDOT) is studying preliminary toll and revenue forecasts and traffic operations impacts resulting from the proposed I-66 Dynamically Priced Toll Lanes project from I-495 (Capital Beltway) to US 29 (Lee Highway – Spout Run) in Arlington County. The purpose of this technical memorandum is to summarize the efforts to date and associated impacts that could result from the project.

2. PROJECT OVERVIEW

In 2012, VDOT and the Virginia Department of Rail and Public Transportation published the I-66 Multimodal Study, Inside the Beltway. This effort was conducted in cooperation with local jurisdictions, transit agencies, and other transportation stakeholders. In 2013, a Supplemental Report was published which further documented a recommended refined alternative to address documented transportation deficiencies in the I-66 corridor inside the Beltway.

In a December 9, 2014 letter to local jurisdictions, Virginia Secretary of Transportation Aubrey L. Layne, Jr. announced VDOT's decision to advance the recommendations from that 2012/2013 study effort. This was further reinforced in a March 12, 2015 briefing to local media and elected officials.

The cornerstone of the recommendations from the 2012/2013 study is the implementation of a variable toll condition along I-66 which will be owned and managed by VDOT, creating a revenue stream to help offset the cost of the multimodal elements in the 2012/2013 study. Conversion of I-66 inside the Beltway to dynamically priced toll lanes during the AM and PM peak periods in both directions will allow free travel for HOV qualified users and will allow VDOT to manage steady flow of traffic overall. The Multimodal improvements receiving funds from the project will be determined by the region through a cooperative process involving the Northern Virginia Transportation Commission.

3. TRAVEL DEMAND MODELING METHODOLOGY

This section presents a brief description of the travel demand model (TDM) and modeling methodology used in the I-66 inside the Beltway Level 2 Traffic and Revenue Study. The project team used the Metropolitan Washington Council of Governments (MWCOG) TDM Version 2.3, Build 57 as the regional model for this study. The MWCOG TDM Version 2.3, Build 57 is a four-step TDM adopted for the Washington, DC metropolitan area.

The model was last calibrated and validated to year 2007/2008 conditions by MWCOG and further modified during 2010 model year validation. The area represented by this model includes the District of Columbia, neighboring parts of Maryland and Virginia, and one county in West Virginia (total 22 jurisdictions/counties). The 6,800 square-mile modeled area is divided into 3,722 traffic analysis zones (TAZs). The Version 2.3, Build 57 model uses Round 8.3 socioeconomic forecasts and includes four time-of-day periods for traffic assignment. This model includes six user classes:

1. Single-occupant vehicle (SOV)
2. High-occupant vehicle with two persons (HOV-2)
3. High-occupant vehicle with three or more persons (HOV-3+)
4. Medium and heavy trucks
5. Commercial vehicles
6. Airport passengers traveling to/from the three commercial airports

Several improvements have been made to the MWCOG TDM since early 2014 by the project team:

- Further disaggregation of the larger TAZs in order to better replicate access to the roadway network system. In this process, the original 3,722 TAZs were disaggregated to 3,800 TAZs.
- Buses and the auto portion of Park & Ride/Kiss & Ride (PNR/KNR) trips were included in the highway assignment.
- Some network improvements were added to the model.
- Transit improvements for the I-66 outside the Beltway Project were included in the modeling procedure.

Furthermore, the regional model was improved and calibrated by the project team. The major improvements are listed below:

- Reviewed the network coding, including the configuration of the interchanges/intersections in order to validate the street access and turn prohibitions along the project area.
- Further reviewed and validated the network properties within the project area, including number of lanes, link speeds, and link capacities.
- Reviewed the future networks, including the transportation improvement plans.
- Reviewed the model results in each step, including trip rates, trip length, share of travel modes, and assignment parameters.
- Further improved the model assignment by splitting the model into eight time periods and developing the eight separate time-of-day assignment procedures. The eight time periods used in the model are as follows:

A1	5:30 AM	6:30 AM
A2	6:30 AM	9:00 AM
A3	9:00 AM	10:00 AM
MD	10:00 AM	3:00 PM
P1	3:00 PM	4:00 PM
P2	4:00 PM	6:30 PM
P3	6:30 PM	7:30 PM
NT	7:30 PM	5:30 AM

Figure 1 - Travel Demand Model Time Periods

This improvement was implemented by using National Household Travel Survey (NHTS) data and further adjusting the time-of-day (AP/PA) factors prior to the assignment step. This step was a major improvement, allowing the study to have AM and PM model periods consistent with the HOV restrictions inside the Beltway. This in turn enabled the project team to conduct a base year model calibration consistent with field observations, which otherwise would not be suitable for analyzing the 2.5-hour vs. 4-hour operating conditions.

- Validated the external stations' traffic and the allocations of external-to-internal trips.
- Calibrated the model for I-66 inside and outside the Beltway to be consistent with HOV restrictions in order to better replicate the existing (2014) traffic conditions within the project area.
- Developed a sub-area model in order to reduce model run time and improve the sensitivity analysis.
- Developed a toll diversion program within the assignment step. While the project is coded as express lanes within the regional model in order to account for the effects of the project on the distribution and mode choice steps, the project team included logit-based toll diversion functions within the assignment step to estimate the toll-paying customers based on the monetary tolls and travel time savings. Toll diversion functions are included separately by trip purpose and vehicle class. **Figure 2** below presents a flowchart summarizing the modeling procedure.
- Included the I-66 outside the Beltway express lane project within the model in order to capture the effects of this project on the I-66 inside the Beltway dynamically priced toll lanes. The toll assignment procedure estimates the toll-paying trips while both projects are included in the model simultaneously, accounting for the effects of the projects on each other.
- In line with developing a consistent methodology across all the express lane facilities within the model to account for the corresponding interactions, the I-495 Express Lanes were also included in the toll diversion program.
- Developed separate trip tables to model hybrid vehicles and SOV violator vehicles currently utilizing I-66 during the AM and PM HOV restriction periods.

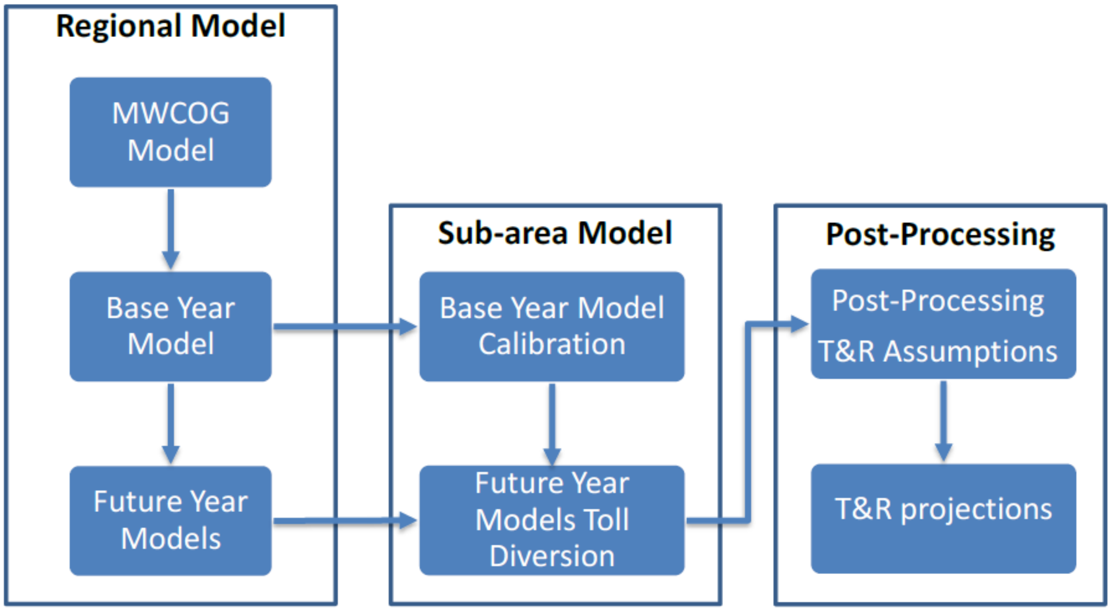

Figure 2 - Modeling Methodology Flowchart

4. ORIGIN/DESTINATION DATA (EXISTING/FUTURE)

The I-66 inside the Beltway corridor serves not only the jurisdictions immediately adjacent to the facility, but it also serves the surrounding communities outside the Capital Beltway for access to the urban core of Arlington, Virginia and Washington DC. Furthermore, with regional job growth in areas like Tysons and the Dulles corridor, an increasing number of residents from inside the Beltway communities are travelling outside the Beltway during traditional inbound/outbound commuting periods.

Therefore, in order to establish where the various users of the I-66 facility are coming from or traveling to as calculated in the travel demand model, the project team developed origin-destination information on I-66 inside the Beltway users by running "Select Link" analyses during the traffic assignment. A select link assignment records the origin zone and destination zone of all trips that use the link in the assignment process. By aggregating the origins and destinations to county totals (which include the various independent cities and towns within each county), the study team can document the model's forecast of how people will use the corridor. The select link runs were done on the I-66 outside the Beltway model which has both I-66 inside the Beltway and I-66 outside the Beltway projects in the future build alternative. The following figures summarize the origins and destinations of I-66 inside the Beltway users based on time period and direction of travel. For the purpose of this analysis, the link that was selected was the segment of I-66 just east of the Dulles Connector Road interchange. This segment of I-66 carries the highest traffic volumes on the corridor and serves as one of the final decision points for travel to/from Fairfax or Loudoun Counties. Based on traffic counts conducted in November 2014, approximately 72,000 and 70,000 vehicles travel eastbound and westbound, respectively on this segment of I-66 during a typical weekday.

I-66 Eastbound Origins/Destinations (AM)

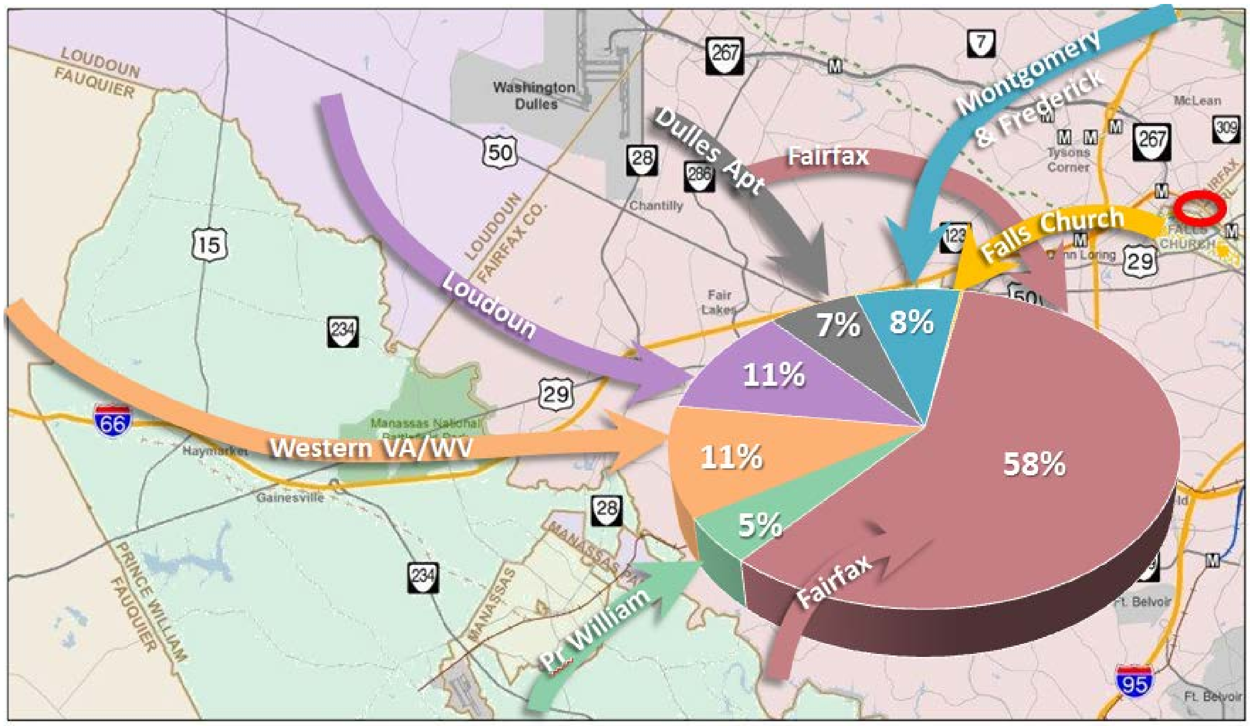

Figure 3 - Existing I-66 Traffic Origins (Travel Demand Model Output - 2015 EB AM)

As shown in **Figure 3**, the majority of the eastbound traffic on I-66 inside the Beltway originates from Fairfax County. The second highest traffic origin location are the western suburbs of the Washington DC metropolitan area which include Loudoun and Fauquier counties, among others. Based on results from the existing travel demand model, approximately 7% of eastbound AM traffic originates from Dulles Airport, which does not include backtracking trips that do not originate from Dulles Airport, but use the services within the airport property to gain access to the Dulles International Airport Access Highway (DIAAH). Therefore, the actual percentage of traffic from the Dulles Airport area may be higher than what is reflected in the travel demand model.

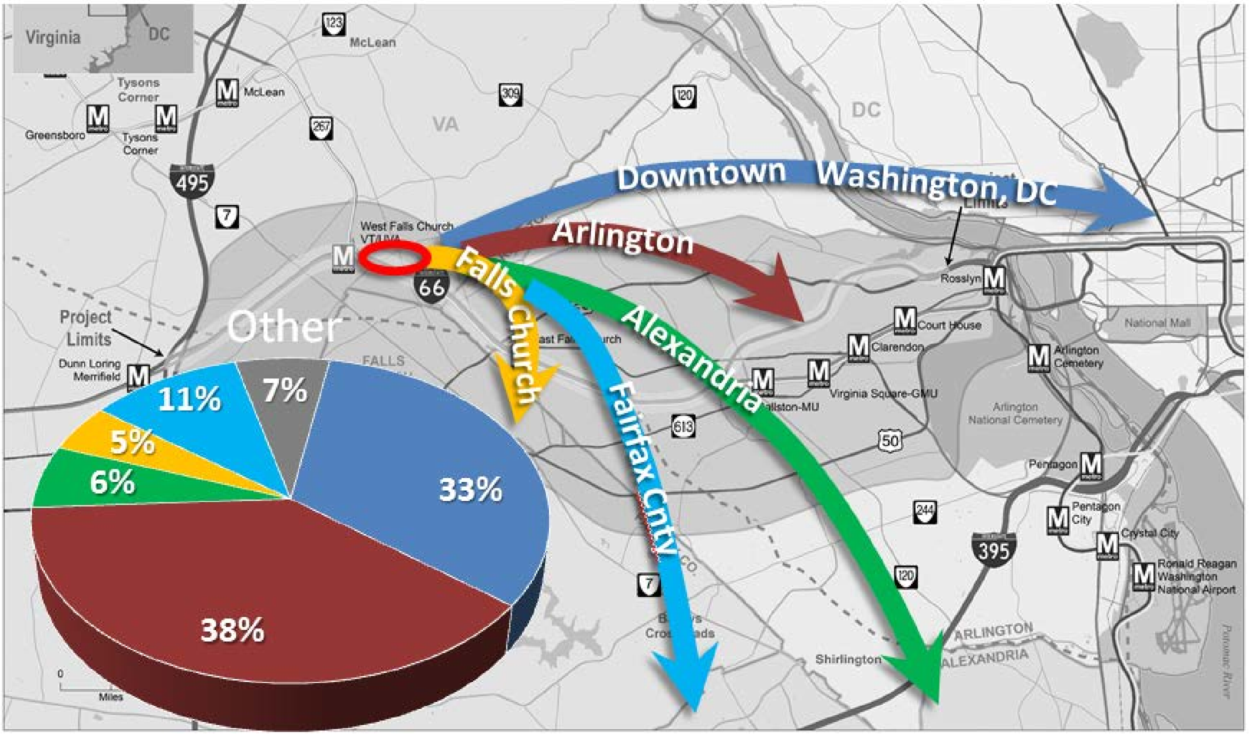

Figure 4 - Existing I-66 Traffic Destinations (Travel Demand Model Output - 2015 EB AM)

Figure 4 summarizes where vehicles are traveling after they reach the eastbound segment of I-66 just east of the Dulles Connector Road interchange. As shown in the figure above, the top destinations for eastbound traffic on I-66 are the Arlington and Washington DC urban cores. Arlington County receives 38% of all eastbound traffic on I-66, while downtown Washington DC receives 33% of all eastbound traffic during the AM peak period.

I-66 Westbound Origins/Destinations (AM)

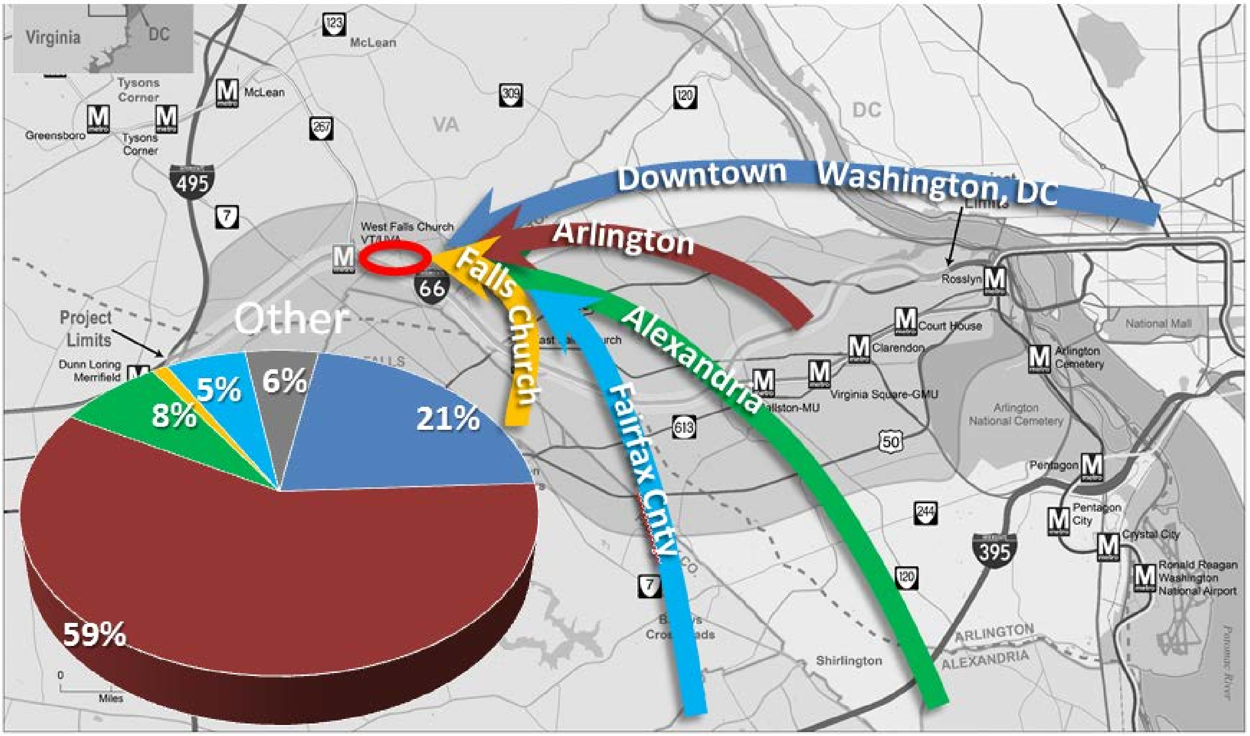

Figure 5 – Existing I-66 Traffic Origins (Travel Demand Model Output - 2015 WB AM)

During the AM peak period, the select link analysis revealed that traffic on westbound I-66 just east of the Dulles Connector Road originates primarily from Arlington County and downtown Washington DC. As shown in **Figure 5**, 59% of all westbound traffic on I-66 originates from Arlington County with another 21% originating from Washington DC.

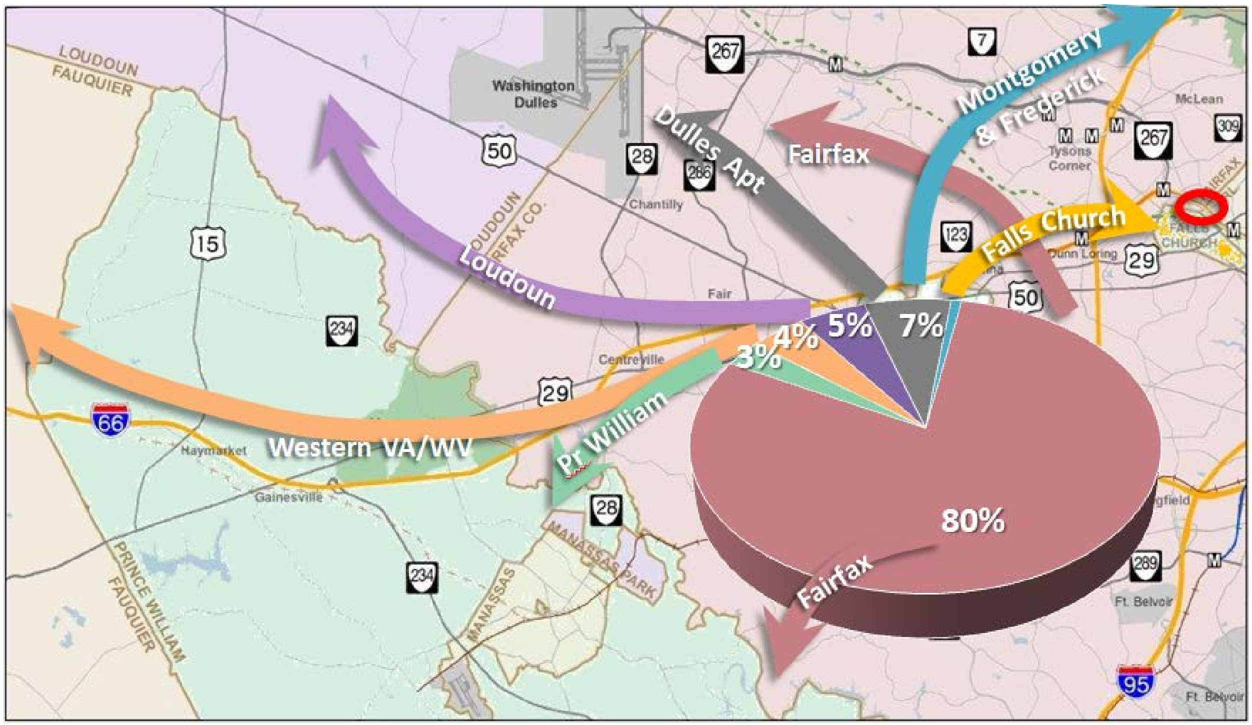

Figure 6 - Existing I-66 Traffic Destinations (Travel Demand Model Output - 2015 WB AM)

Figure 6 summarizes where vehicles are traveling after they reach the westbound segment of I-66 just east of the Dulles Connector Road interchange. As shown in the figure above, the top destinations for westbound traffic on I-66 during the AM peak period are Fairfax County and Dulles Airport. Fairfax County receives 80% of all westbound traffic on I-66, while Dulles Airport receives 7% of all westbound traffic during the AM peak period.

I-66 Eastbound Origins/Destinations (PM)

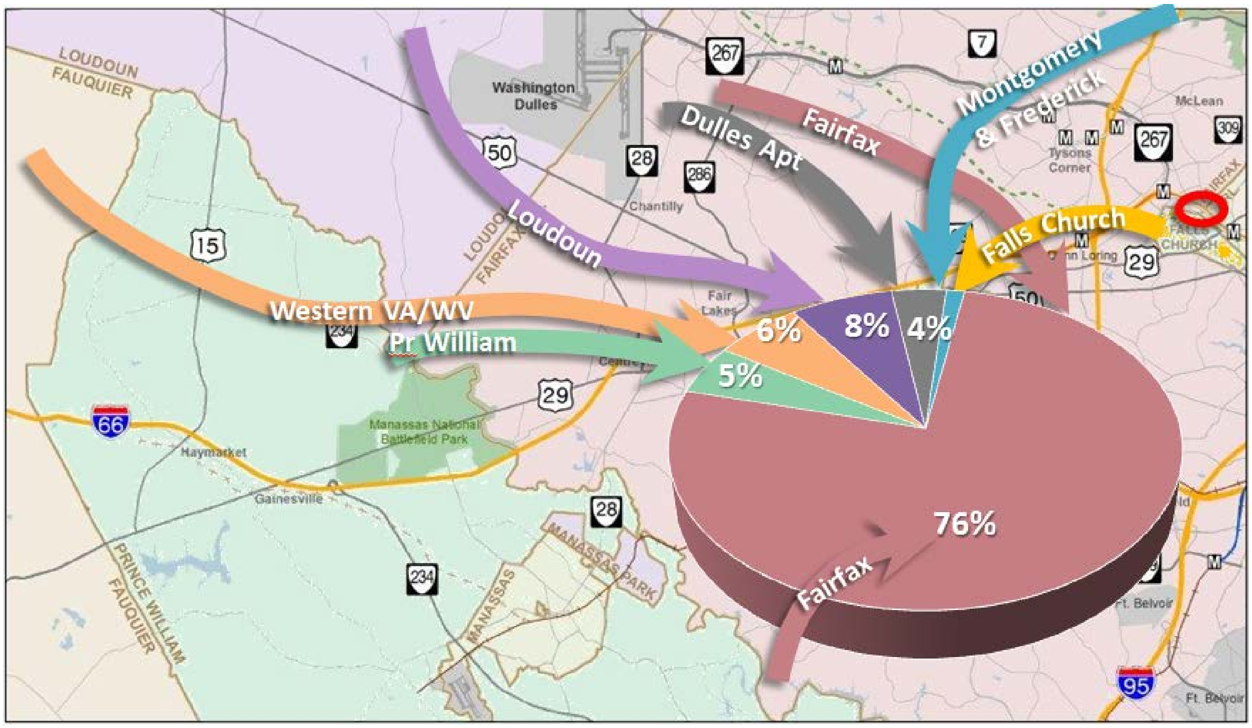

Figure 7 - Existing I-66 Traffic Origins (Travel Demand Model Output - 2015 EB PM)

As shown in **Figure 7**, the majority of the eastbound traffic on I-66 inside the Beltway originates from Fairfax County while the second highest percentage of trips originates from Loudoun County. As shown above, approximately 4% of eastbound PM traffic originates from Dulles Airport, which does not include backtracking trips that do not originate from Dulles Airport, but use the services within the airport property to gain access to the Dulles International Airport Access Highway (DIAAH). Therefore, the actual percentage of traffic from the Dulles Airport area may be higher than what is reflected in the travel demand model.

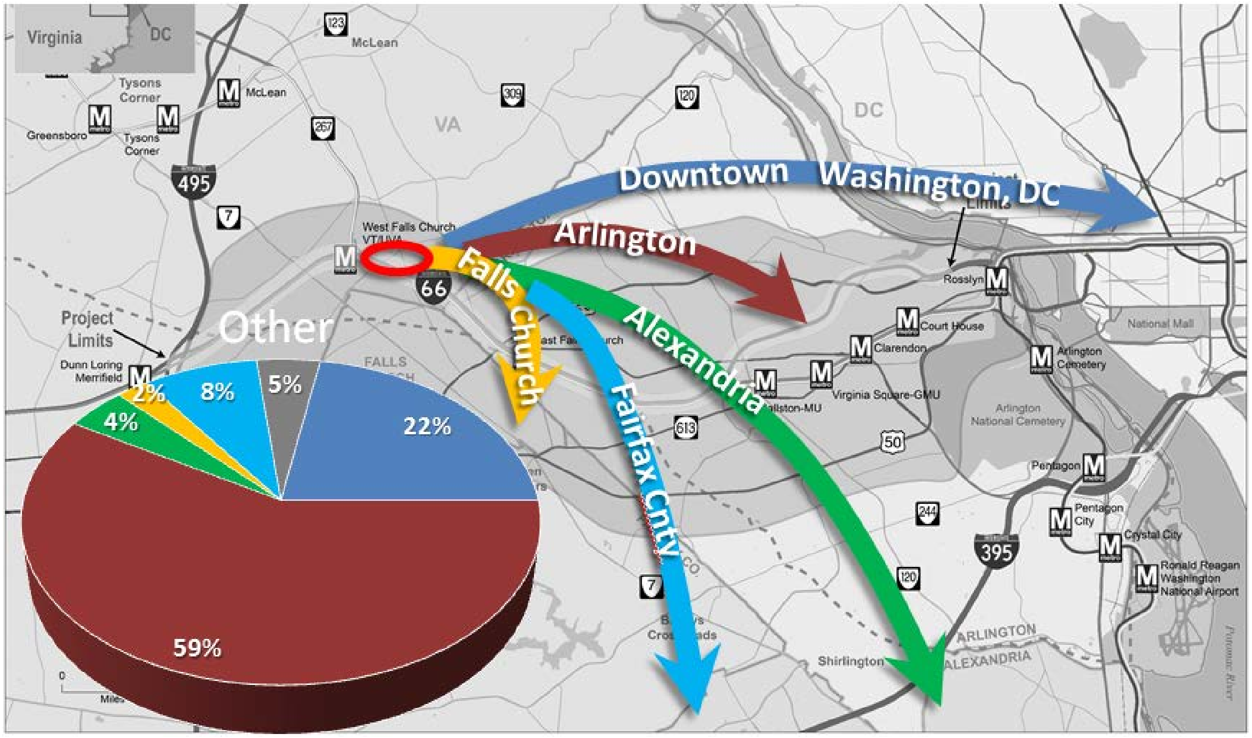

Figure 8 - Existing I-66 Traffic Destinations (Travel Demand Model Output - 2015 EB PM)

Figure 8 summarizes where vehicles are traveling after they reach the eastbound segment of I-66 just east of the Dulles Connector Road interchange during the PM peak period. As shown in the figure above, the top destinations for eastbound traffic on I-66 are the Arlington and Washington DC urban cores. Arlington County receives 59% of all eastbound traffic on I-66, while downtown Washington DC receives 22% of all eastbound traffic during the PM peak period.

I-66 Westbound Origins/Destinations (PM)

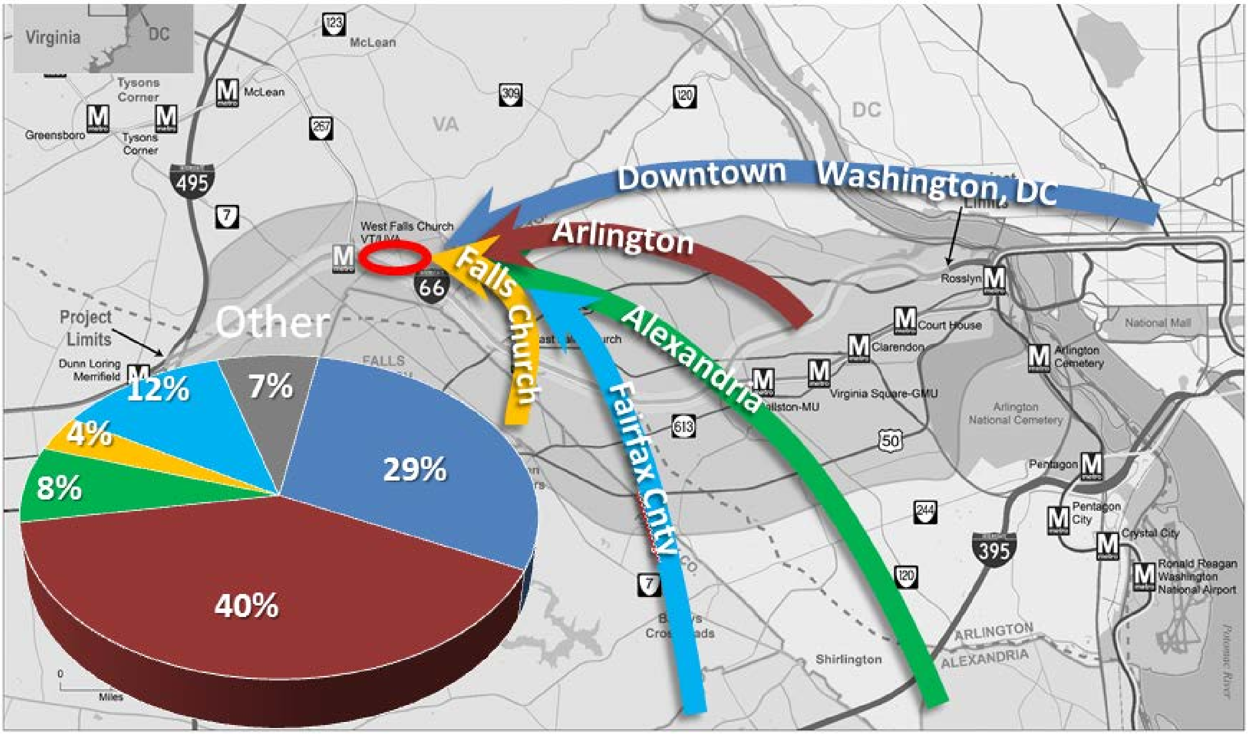

Figure 9 - Existing I-66 Traffic Origins (Travel Demand Model Output - 2015 WB PM)

During the PM peak period, the select link analysis revealed that traffic on westbound I-66 just east of the Dulles Connector Road originates primarily from Arlington County and downtown Washington DC. As shown in **Figure 9**, 40% of all westbound traffic on I-66 originates from Arlington County with another 29% originating from Washington DC during the PM peak period.

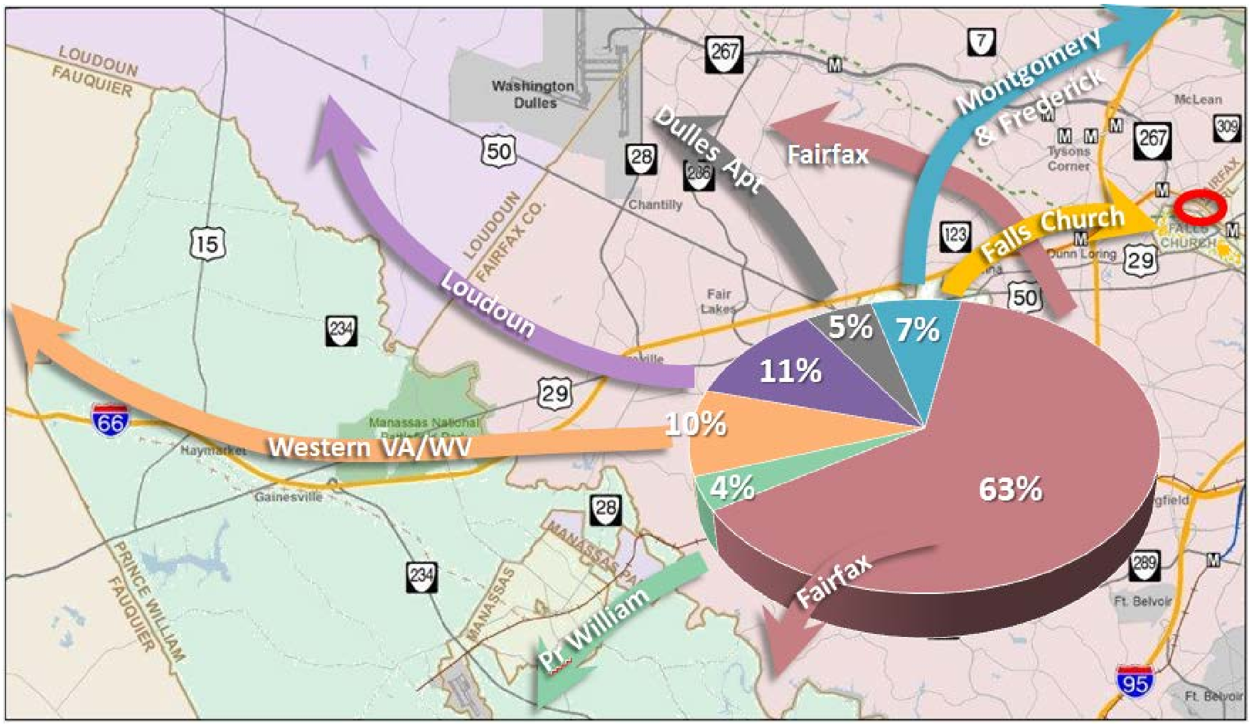

Figure 10 - Existing I-66 Traffic Destinations (Travel Demand Model Output - 2015 WB PM)

Figure 10 summarizes where vehicles are traveling after they reach the westbound segment of I-66 just east of the Dulles Connector Road interchange. As shown in the figure above, the top destinations for westbound traffic on I-66 during the PM peak period are Fairfax County and Loudoun County. Fairfax County receives 63% of all westbound traffic on I-66, while Loudoun County receives 11% of all westbound traffic during the PM peak period.

5. FUTURE TRAFFIC VOLUME CHANGES

The focus of this section deals with potential changes in peak hour traffic volumes and patterns that may result from the conversion of I-66 inside the Beltway to a dynamically priced toll lane facility. With this change in operation of I-66, diversion to/from I-66 may occur based on:

- Users' willingness to pay toll,
- Demand on I-66 or parallel arterials,
- Change in HOV/Toll period from 2.5 hours to 4 hours,
- Requirement to have a transponder

The study efforts to date on the projected future traffic volumes on I-66 and other parallel roadways have involved analyzing relative changes in peak hour volumes within the study area as opposed to absolute forecasts.

While it is not the intent of this study to analyze each individual route within the I-66 project area that could potentially absorb trips diverted to/from I-66, efforts can be made to analyze the impacts to the primary east-west routes that serve the various localities along the corridor. As such, meetings were held with VDOT, locality stakeholders, and the project team to establish screen lines that were used to analyze differences between future No-Build and Build scenarios at various locations within the project area. As a result of these meetings, a series of five screen lines were developed as described below:

- **Screen Line 1:** Pimmit Hills/Fairview Park
- **Screen Line 2:** West Falls Church
- **Screen Line 3:** East Falls Church – West Arlington
- **Screen Line 4:** Ballston – Virginia Square
- **Screen Line 5:** Rosslyn

It is at these locations where No-Build/Build traffic volume comparisons will be made for the two Build scenarios to determine which routes may experience an increase or decrease in traffic volume during the AM and PM peak hours as a result of the project. For the purpose of this study, the two 2017 Build scenarios consist of:

- Operating I-66 as dynamically priced toll lanes in both directions during the AM and PM peak commuting periods (HOV-2+ vehicles are toll free),
- Operating I-66 as a dynamically priced toll lane facility in both directions during the AM and PM peak commuting periods and increasing the HOV occupancy requirement for free travel on I-66 to HOV-3+.

A summary of the locations of the proposed screen lines are shown in **Figure 11**. The 20 arterial screen line locations shown in **Figure 11** were identified as primary east-west routes that parallel I-66 or provide additional access to/from I-66, Arlington, or Washington DC within the study area. The I-66 screen line represent locations where existing traffic volume data has been collected during the initial stages of this study.

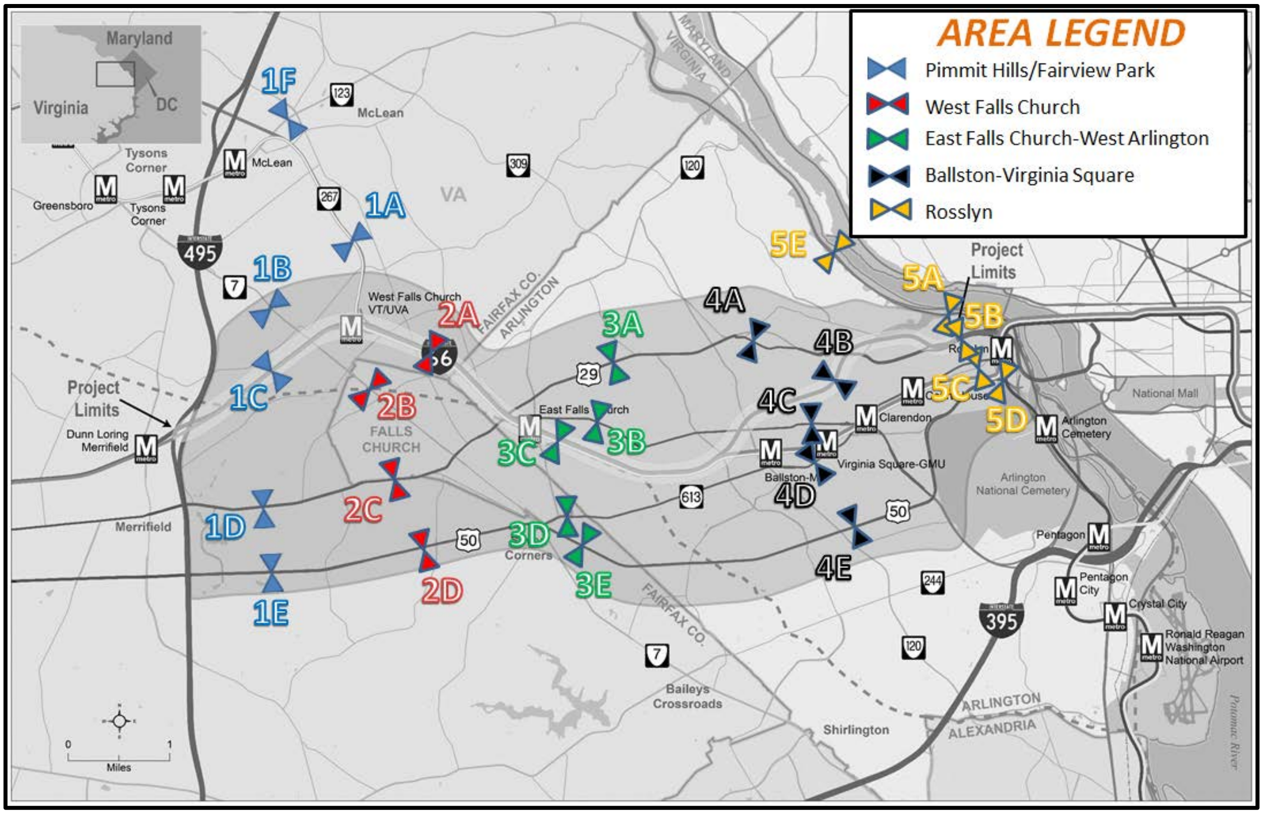

Figure 11 - Traffic Volume Screen Line Locations

It should be noted that this project is for dynamically priced toll lanes that allow free travel for HOV qualified users and will be referred to as HOT-2+ and HOT-3+ in the following figures and tables to distinguish the two HOV occupancy scenarios that have been studied for this report. For the purpose of this report, the traffic volumes summarized in the following figures and tables are direct outputs from the travel demand model and have not been subject to intensive post processing that is common industry practice.

Furthermore, the travel demand model used for this study has been set up with a peak 2.5 hour period with additional shoulder periods to make up the 4-hour tolling period to be implemented with this project. The operation hours are as follows:

- Total 4-hour period: 5:30 AM to 9:30 AM, and 3:00 PM to 7:00 PM
- Peak 2.5-hour period: 6:30 AM to 9:00 AM and 4:00 PM to 6:30 PM.

The travel demand model does not identify an exact peak hour within the peak 2.5 hour analysis period; however, the peak hour traffic volumes and subsequent analyses are based on the "peak of the 2.5 hour period."

Figure 12 presents a visual summary of the traffic volume changes for the 2017 No-Build condition compared to the 2017 Build condition where eastbound I-66 will operate as a HOT-2+ facility during the AM peak hour.

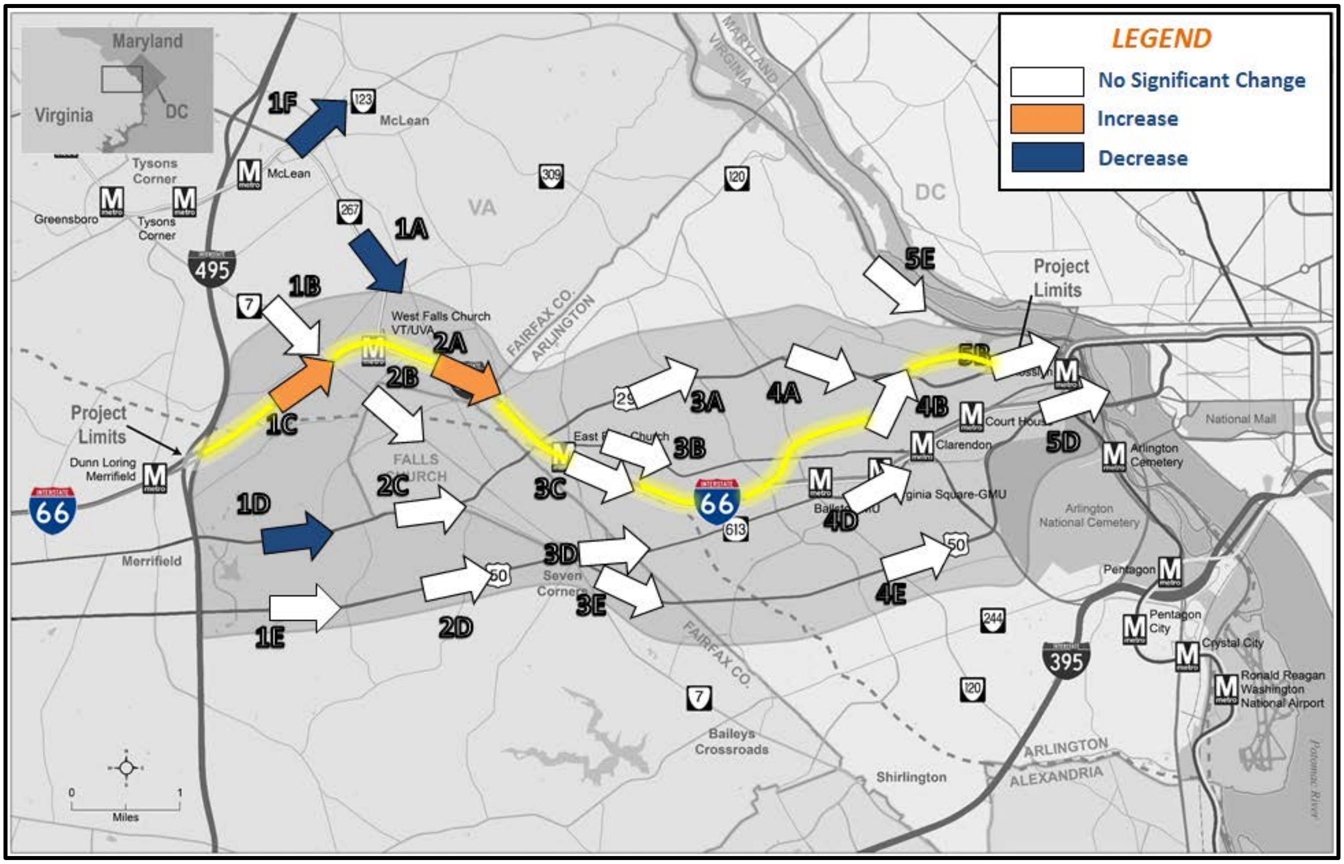

Figure 12 - 2017 HOT-2+ Traffic Volume Changes (EB AM Peak Hour)

As shown in **Figure 12**, the travel demand model results revealed that in general, traffic volume changes within the I-66 study area are relatively minor during the AM peak hour for the eastbound direction as denoted by the white arrows. The white arrows, identified as "No Significant Change" are shown for screen lines that are expected to experience an increase or decrease in traffic volumes of 100 vehicles or less during the respective peak hour analyzed. Traffic volumes are forecasted to increase along the two western screen lines of I-66 with decreases in eastbound traffic on US 29, VA 267, and VA 123 during the AM peak hour.

Table 2 summarizes the peak hour differences in traffic volumes in terms of the numerical and percent changes between the 2017 No-Build and 2017 HOT-2+ Build scenarios. Eastbound traffic volumes on US 29 are anticipated to decrease as much as nearly 8% near I-495 or increase by as much as nearly 4% during the AM peak hour. Volume changes on other parallel arterials such as US 50, VA 7, and Wilson Boulevard, for example, are expected to be within +/- 3%. Traffic volumes on eastbound I-66 are anticipated to increase by as much as 29% between I-495 and VA 7 and less than 1% near the Ballston/Rosslyn area during the AM peak hour.

I-66 Corridor Traffic Volume Changes (2017 EB AM HOT-2+)			
Facility	**Screen Line**	**Peak Hour Volume Difference**	**% Change**
I-66	1C	490	28.5%
	2A	190	4.8%
	3C	60	1.6%
	4B	10	0.3%
	5B	5	0.2%
US 29	1D	-120	-7.8%
	2C	-55	-3.3%
	3A	35	3.9%
	4A	30	1.7%
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US 50	1E	-35	-1.1%
	2D	-25	-1.1%
	3E	-55	-1.8%
	4E	-20	-0.7%
	5D	-40	-1.3%
VA 7	1B	-30	-1.8%
	2B	-10	-0.5%
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VA 123	1F	-100	-3.5%
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Washington Blvd	3B	-30	-5.9%
	4C	-35	-3.9%
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Wilson Blvd	3D	40	2.6%
	4D	-30	-3.4%
	5C	-20	-2.5%
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Table 1 - 2017 HOT-2+ Traffic Volume Changes by Screen Line (EB AM Peak Hour)

Figure 12 presents a visual summary of the traffic volume changes for the 2017 No-Build condition compared to the 2017 Build condition where westbound I-66 will operate as a HOT-2+ facility during the AM peak hour.

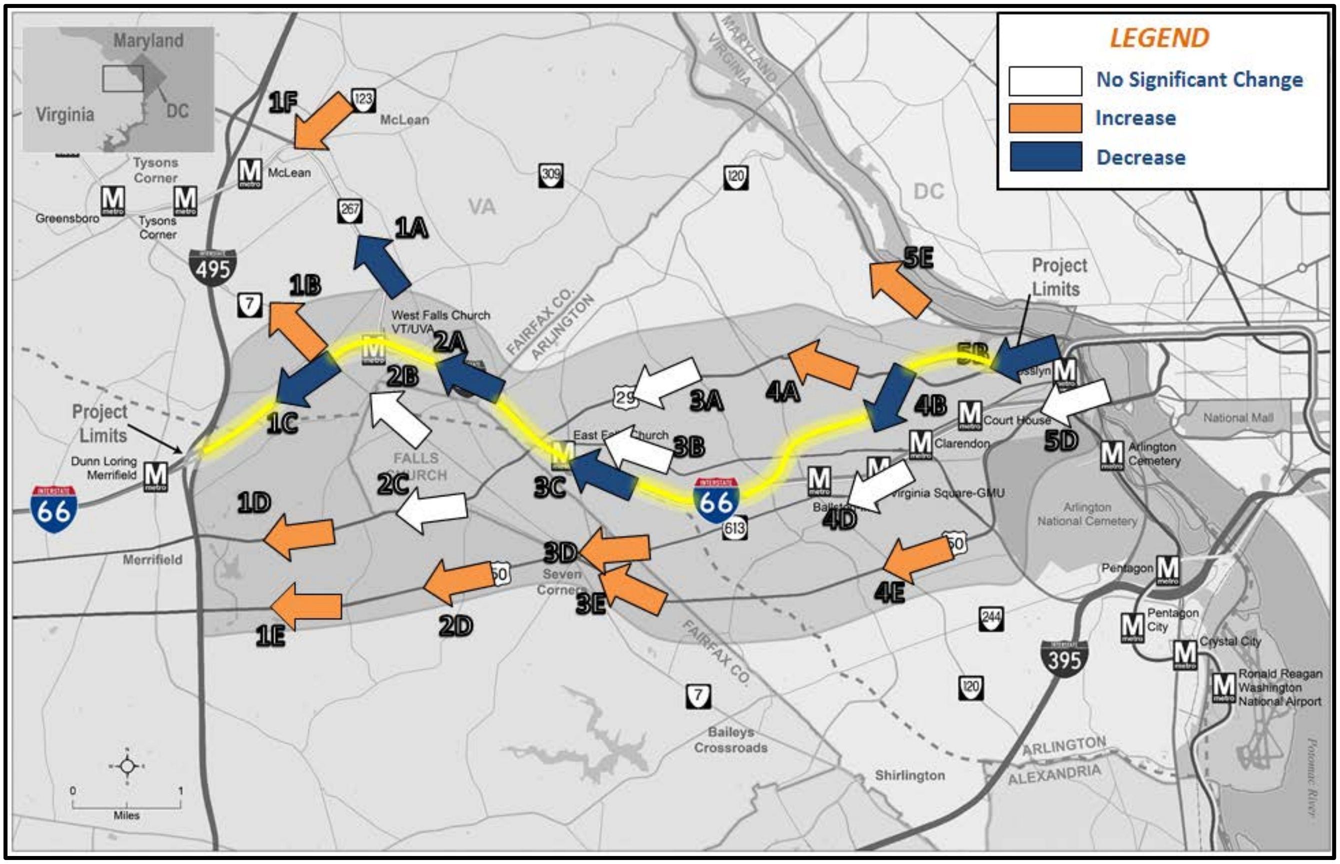

Figure 13 - 2017 HOT-2+ Traffic Volume Changes (WB AM Peak Hour)

As shown in **Figure 13**, the travel demand model results revealed that westbound traffic volumes are anticipated to decrease on I-66 and divert to westbound US 50 during the AM peak hour. Additional diversion is expected on some segments of US 29, George Washington Parkway, and VA 123. As summarized in **Table 3** below, traffic volume increases on these parallel arterials are expected to be between 20% and 40% on US 50 and between 23% and 70% on US 29. Other parallel routes such as Washington Boulevard and Wilson Boulevard are expected to experience volume increases of 5% and between 14% and 20%, respectively during the AM peak hour. Traffic volumes on westbound I-66 are anticipated to decrease between 30% and 45% during the AM peak hour.

I-66 Corridor Traffic Volume Changes (2017 WB AM HOT-2+)			
Facility	Screen Line	Peak Hour Volume Difference	% Change
I-66	1C	-1390	-45.4%
	2A	-1630	-31.6%
	3C	-1300	-30.9%
	4B	-1200	-34.0%
	5B	-890	-32.9%
US 29	1D	330	50.7%
	2C	95	23.3%
	3A	-60	-20.0%
	4A	230	70.0%
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US 50	1E	410	21.0%
	2D	455	40.8%
	3E	330	18.9%
	4E	320	27.3%
	5D	40	1.3%
VA 7	1B	310	35.1%
	2B	55	3.7%
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VA 123	1F	470	21.3%
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Washington Blvd	3B	20	5.4%
	4C	50	5.7%
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Wilson Blvd	3D	160	19.4%
	4D	-15	-1.9%
	5C	100	14.0%
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Table 2 - 2017 HOT-2+ Traffic Volume Changes by Screen Line (WB AM Peak Hour)

Figure 13 presents a visual summary of the traffic volume changes for the 2017 No-Build condition compared to the 2017 Build condition where eastbound I-66 will operate as a HOT-2+ facility during the PM peak hour.

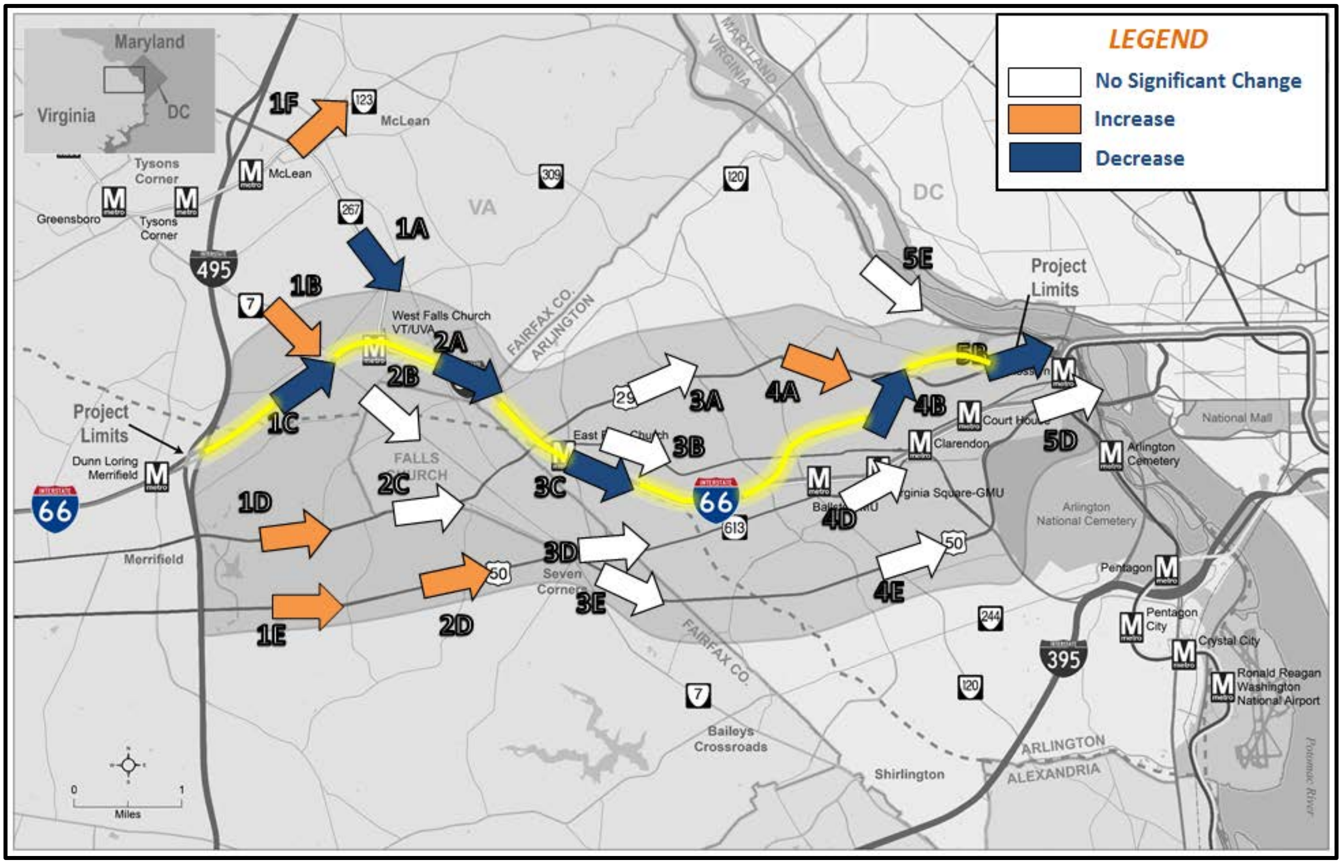

Figure 14 - 2017 HOT-2+ Traffic Volume Changes (EB PM Peak Hour)

As shown in **Figure 14**, the travel demand model results revealed that eastbound traffic volumes are anticipated to decrease on I-66 and divert to eastbound US 50 during the PM peak hour. Additional diversion is expected on some segments of US 50, US 29, VA 7, and VA 123. **Table 4** summarizes the anticipated eastbound traffic diversion between I-66 and the parallel arterials as a result of the 2017 HOT-2 Build scenario during the PM peak hour. Traffic volume increases on parallel arterials such as US 29 are expected to range between 1% and 25% during the AM peak hour. Additional diversion onto US 50 is also expected, ranging between 3% and 25% with other routes such as Wilson Boulevard forecasted to experience increases in traffic volumes between 1% and 3% during the AM peak hour. Traffic volumes on eastbound I-66 are anticipated to decrease between 10% and 29% during the PM peak hour.

I-66 Corridor Traffic Volume Changes (2017 EB PM HOT-2+)			
Facility	Screen Line	Peak Hour Volume Difference	% Change
I-66	1C	-760	-28.6%
	2A	-660	-14.6%
	3C	-370	-10.4%
	4B	-570	-16.5%
	5B	-500	-17.4%
US 29	1D	140	13.5%
	2C	90	9.5%
	3A	5	0.8%
	4A	170	25.0%
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US 50	1E	300	20.8%
	2D	180	25.1%
	3E	50	3.4%
	4E	70	7.8%
	5D	80	2.9%
VA 7	1B	120	9.0%
	2B	0	0.0%
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VA 123	1F	315	13.7%
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Washington Blvd	3B	-10	-2.7%
	4C	45	5.7%
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Wilson Blvd	3D	15	1.3%
	4D	15	1.8%
	5C	20	2.7%
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Table 3 - 2017 HOT-2+ Traffic Volume Changes by Screen Line (EB PM Peak Hour)

Figure 14 presents a visual summary of the traffic volume changes for the 2017 No-Build condition compared to the 2017 Build condition where westbound I-66 will operate as a HOT-2+ facility during the PM peak hour.

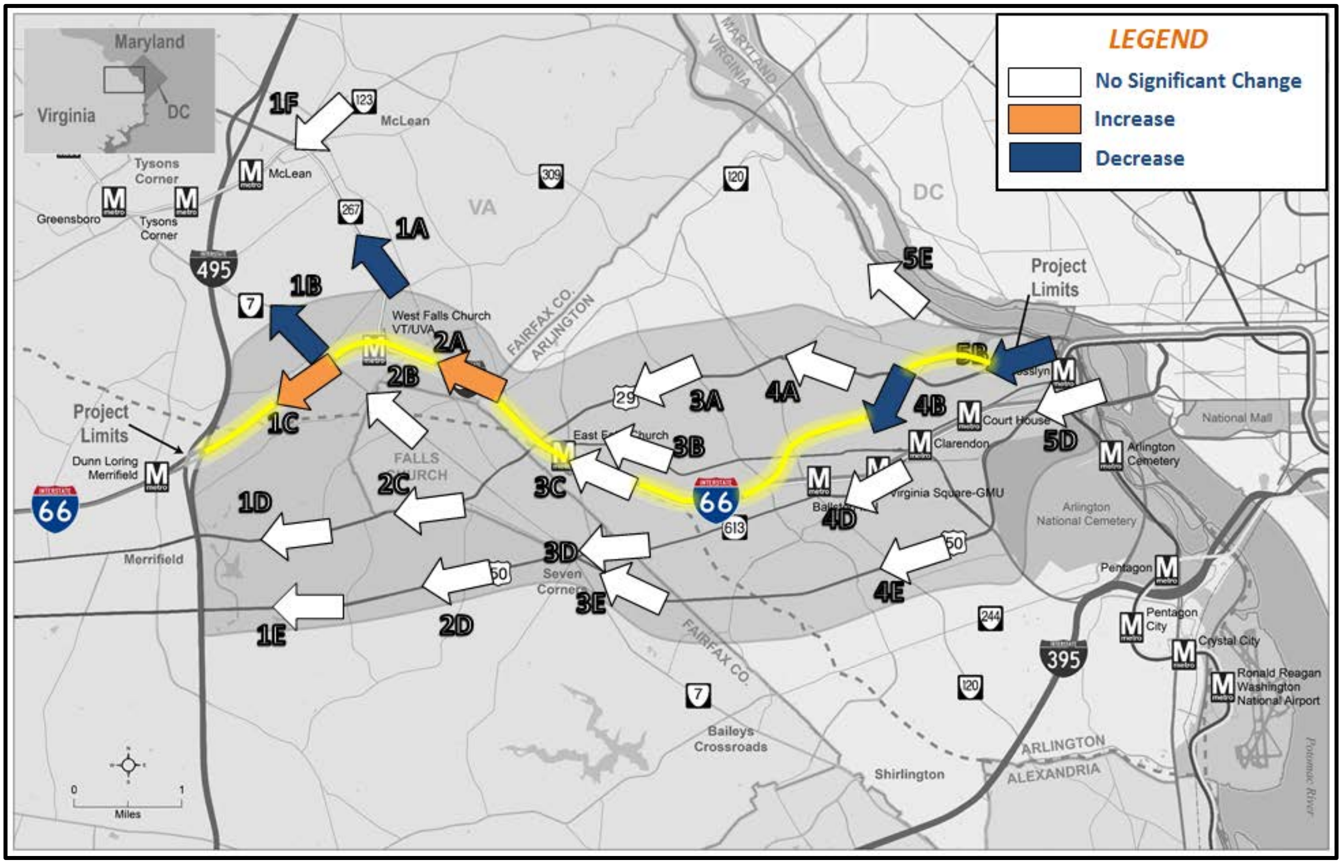

Figure 15 - 2017 HOT-2+ Traffic Volume Changes (WB PM Peak Hour)

Similar to the traffic volume changes forecasted on eastbound I-66 during the AM peak hour, the travel demand model results for the westbound PM peak hour revealed that in general, traffic volume changes within the I-66 study area are relatively minor as denoted by the white arrows. As shown in **Figure 15**, traffic volumes are forecasted to increase along the two western screen lines of I-66 with decreases along the two eastern screen lines of I-66 during the PM peak hour. Peak hour traffic volumes are also expected to decrease on VA 7 and VA 267 during the PM peak hour as a result of westbound I-66 operating as a dynamically priced toll lane facility.

Table 5 summarizes the peak hour differences in traffic volumes in terms of the numerical and percent changes between the 2017 No-Build and 2017 HOT-2+ Build scenarios. Westbound traffic volumes changes on parallel routes such as US 29, US 50, and Wilson Boulevard are expected to be +/- 100 vehicles during the PM peak hour, resulting in percent changes of +/- 1% on US 29 and +/- 2% on US 50. Westbound traffic volumes on I-66 are expected to increase along the western portion of the corridor, ranging from 4% near the Dulles Connector Road and 22% near I-495 during the PM peak hour.

I-66 Corridor Traffic Volume Changes (2017 WB PM HOT-2+)			
Facility	Screen Line	Peak Hour Volume Difference	% Change
I-66	1C	345	21.8%
	2A	170	4.2%
	3C	-50	-1.2%
	4B	-135	-4.2%
	5B	-135	-4.9%
US 29	1D	-30	-1.6%
	2C	-10	-0.5%
	3A	15	1.1%
	4A	-20	-1.3%
	--	--	--
US 50	1E	-70	-2.4%
	2D	-20	-0.8%
	3E	35	1.2%
	4E	55	2.1%
	5D	15	0.4%
VA 7	1B	-180	-12.5%
	2B	-25	-1.6%
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	--		
VA 123	1F	45	1.7%
	--		
	--		
	--		
	--		
Washington Blvd	3B	-10	1.0%
	4C	10	1.0%
	--		
	--		
	--		
Wilson Blvd	3D	-50	-3.6%
	4D	-20	-2.5%
	5C	-45	-6.6%
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Table 4 - 2017 HOT-2+ Traffic Volume Changes by Screen Line (WB PM Peak Hour)

Figure 15 presents a visual summary of the traffic volume changes for the 2017 No-Build condition compared to the 2017 Build condition where eastbound I-66 will operate as a HOT-3+ facility during the AM peak hour.

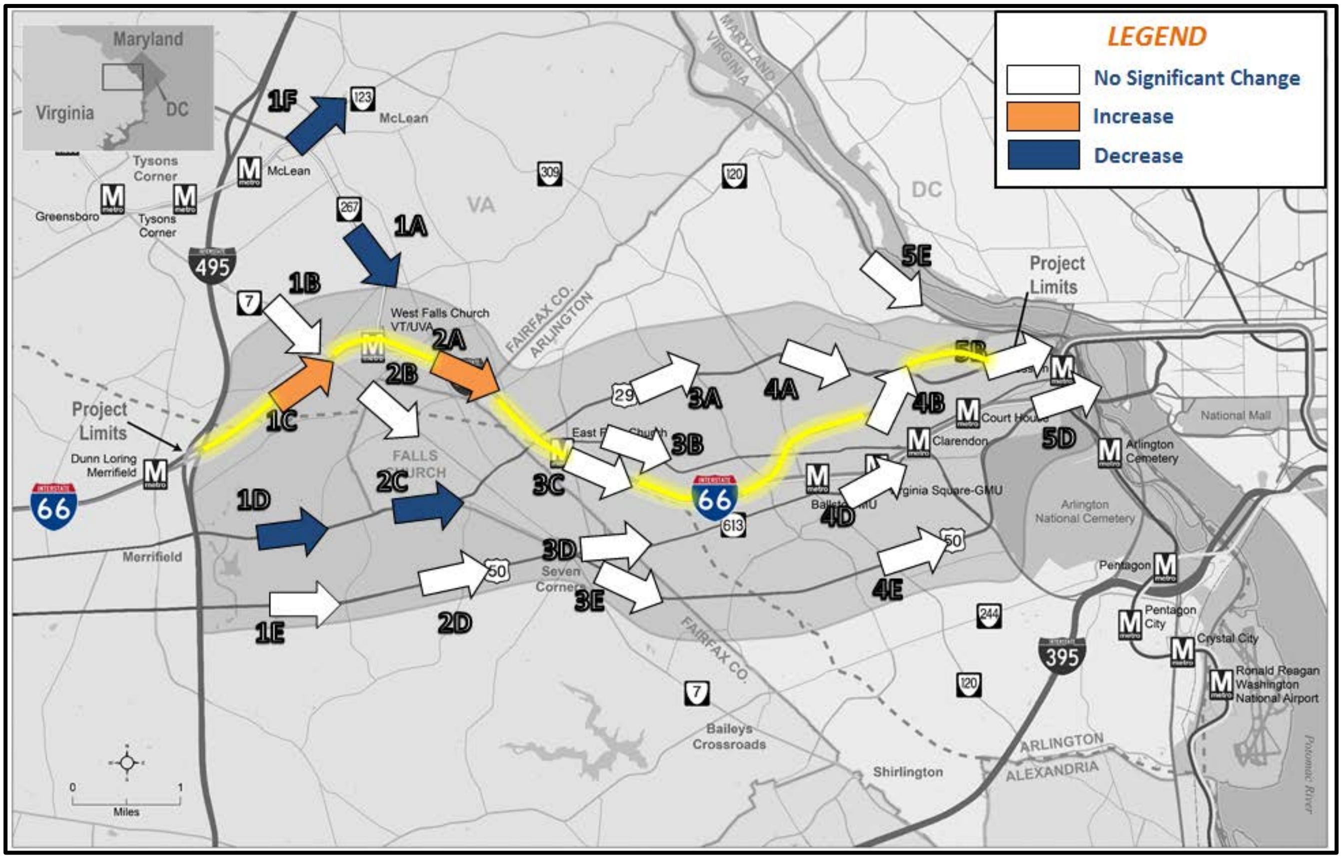

Figure 16 - 2017 HOT-3+ Traffic Volume Changes (EB AM Peak Hour)

As shown in **Figure 16**, the travel demand model results revealed that in general, traffic volume changes within the I-66 study area are relatively minor during the AM peak hour for the eastbound direction as denoted by the white arrows. Similar to the pattern exhibited during the 2017 HOT-2+ Build scenario, traffic volumes are forecasted to increase along the two western screen lines of I-66 with decreases in eastbound traffic on US 29, VA 267, and VA 123 during the AM peak hour.

Table 6 summarizes the peak hour differences in traffic volumes in terms of the numerical and percent changes between the 2017 No-Build and 2017 HOT-3+ Build scenarios. Eastbound traffic volumes on the parallel arterials are expected to generally decrease across the entire study area. Forecasted traffic volumes are expected to decrease between 1% and 12% on US 29, and between 1% and 4% on US 50 during the AM peak hour. Eastbound traffic volumes on I-66 are expected to increase along the western portion of the corridor, ranging from 4% near the Dulles Connector Road to approximately 40% near I-495 during the AM peak hour.

I-66 Corridor Traffic Volume Changes (2017 EB AM HOT-3+)			
Facility	**Screen Line**	**Peak Hour Volume Difference**	**% Change**
I-66	1C	600	38.3%
	2A	140	3.8%
	3C	-10	-0.2%
	4B	-10	-0.4%
	5B	5	0.2%
US 29	1D	-180	-12.3%
	2C	-110	-7.1%
	3A	-90	-10.3%
	4A	-10	-0.6%
	--	--	--
US 50	1E	-70	-2.4%
	2D	-90	-3.7%
	3E	-30	-1.1%
	4E	-15	-0.5%
	5D	-90	-3.2%
VA 7	1B	-35	-2.4%
	2B	40	2.6%
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VA 123	1F	-115	-4.1%
	--		
	--		
	--		
	--		
Washington Blvd	3B	-15	-2.5%
	4C	-40	-4.4%
	--		
	--		
	--		
Wilson Blvd	3D	-25	-1.8%
	4D	-10	-1.0%
	5C	-35	-4.0%
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Table 5 - 2017 HOT-3+ Traffic Volume Changes by Screen Line (EB AM Peak Hour)

Figure 16 presents a visual summary of the traffic volume changes for the 2017 No-Build condition compared to the 2017 Build condition where westbound I-66 will operate as a HOT-3+ facility during the AM peak hour.

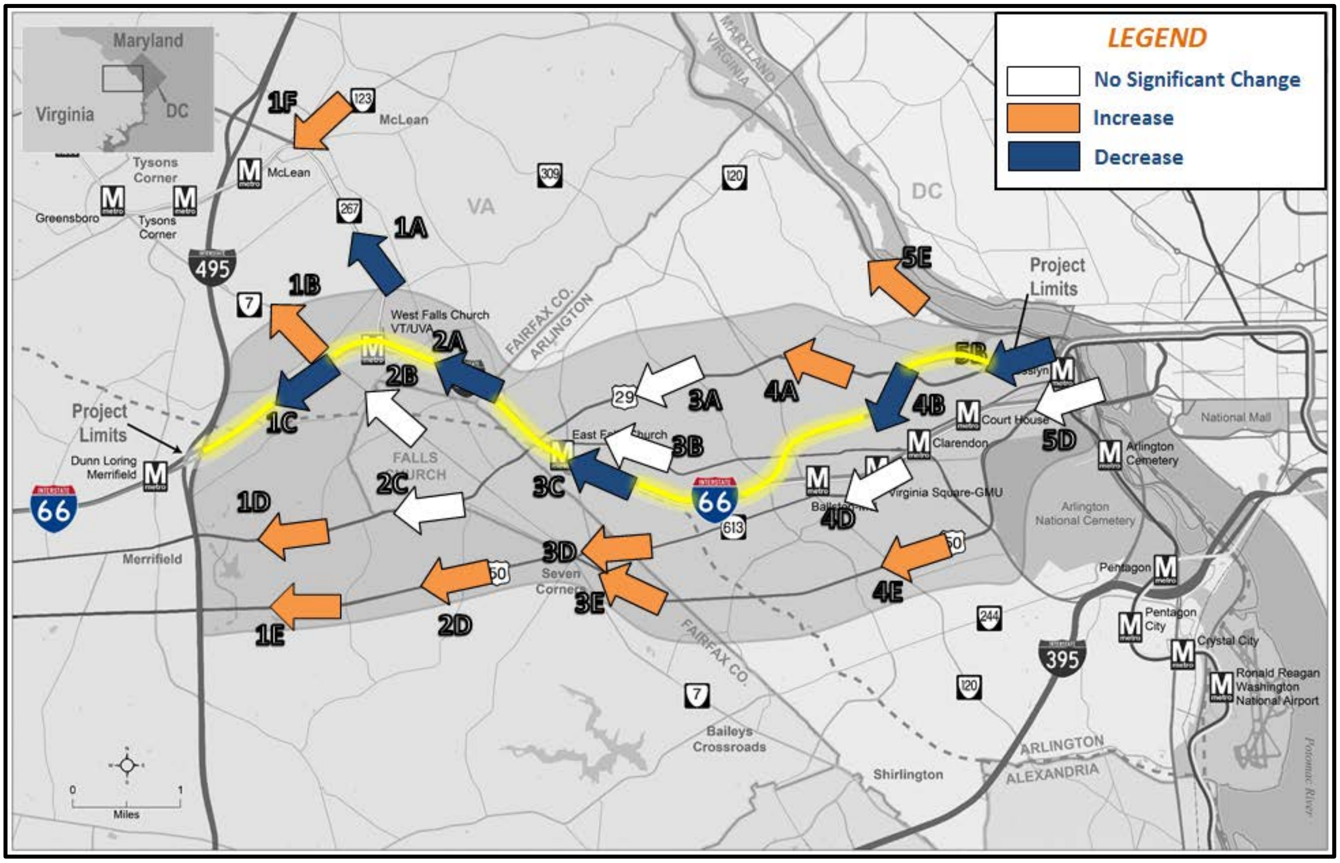

Figure 17 - 2017 HOT-3+ Traffic Volume Changes (WB AM Peak Hour)

As shown in **Figure 17**, the travel demand model results revealed that westbound traffic volumes are anticipated to decrease on I-66 and divert to westbound US 50 during the AM peak hour. Similar to the 2017 HOT-2+ Build scenario, additional diversion is expected on some segments of US 29, George Washington Parkway, VA 123, and VA 7 as a result of the 2017 HOT-3+ Build scenario. As summarized in **Table 7** below, traffic volume increases on these parallel arterials are anticipated to range between 22% and 45% on US 50 and between 22% and 81% on US 29. Traffic volumes on westbound I-66 are anticipated to decrease between 35% and 50% during the AM peak hour as a result of the 2017 HOT-3+ Build scenario.

I-66 Corridor Traffic Volume Changes (2017 WB AM HOT-3+)			
Facility	Screen Line	Peak Hour Volume Difference	% Change
I-66	1C	-1400	-49.6%
	2A	-1670	-35.2%
	3C	-1340	-34.7%
	4B	-1280	-39.5%
	5B	-930	-37.3%
US 29	1D	320	55.1%
	2C	80	22.1%
	3A	-60	-23.3%
	4A	240	81.4%
	--	--	--
US 50	1E	380	21.7%
	2D	450	45.4%
	3E	340	21.6%
	4E	320	30.1%
	5D	15	0.4%
VA 7	1B	300	38.3%
	2B	80	5.8%
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VA 123	1F	450	22.8%
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Washington Blvd	3B	-5	-1.4%
	4C	55	6.8%
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Wilson Blvd	3D	140	18.9%
	4D	10	1.3%
	5C	90	14.0%
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Table 6 - 2017 HOT-3+ Traffic Volume Changes by Screen Line (WB AM Peak Hour)

Figure 17 presents a visual summary of the traffic volume changes for the 2017 No-Build condition compared to the 2017 Build condition where eastbound I-66 will operate as a HOT-3+ facility during the PM peak hour.

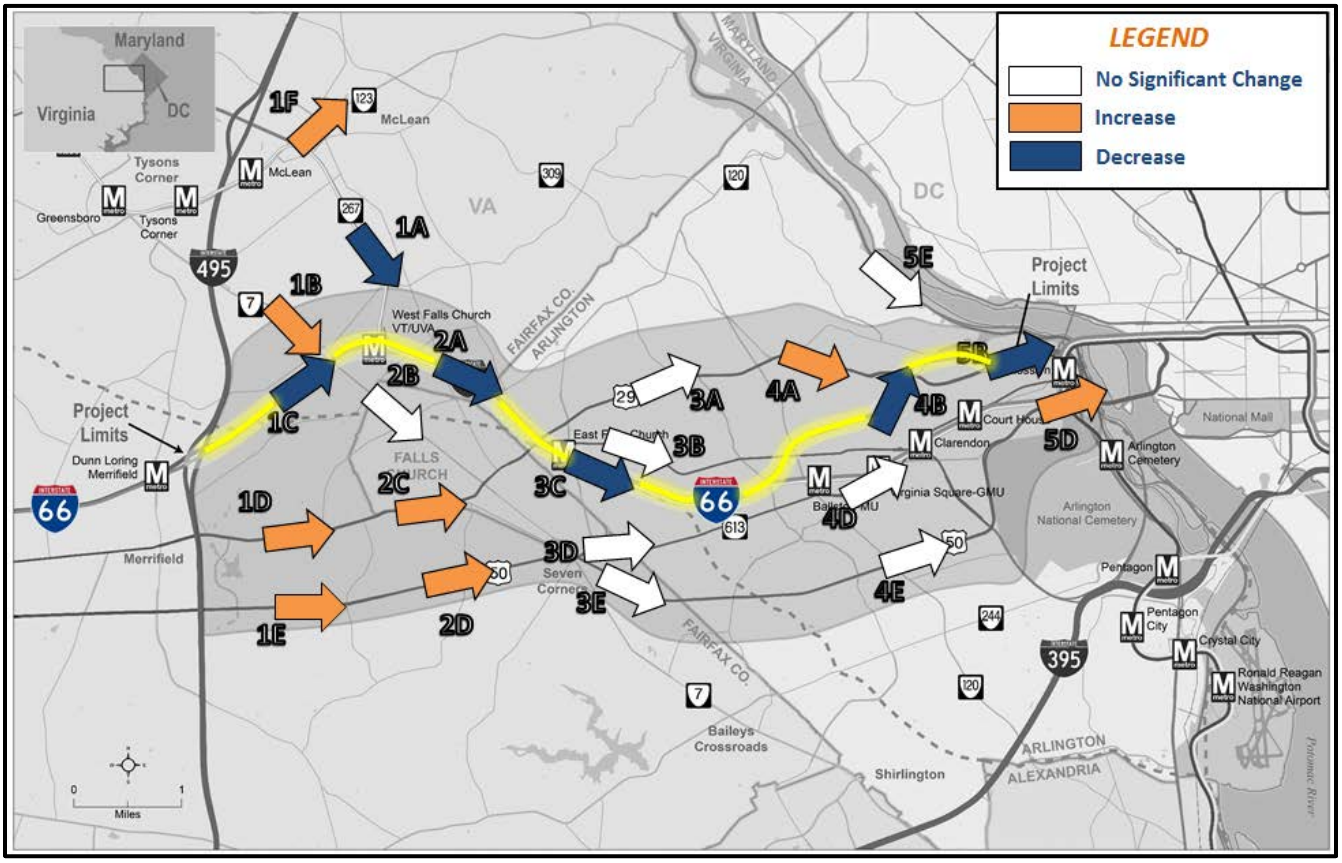

Figure 18 - 2017 HOT-3+ Traffic Volume Changes (EB PM Peak Hour)

As shown in **Figure 18**, the travel demand model results revealed that eastbound traffic volumes are anticipated to decrease on I-66 and divert to eastbound US 50 during the PM peak hour. Additional diversion is expected on some segments of US 50, US 29, VA 7, and VA 123. As summarized in **Table 8** below, eastbound traffic volume increases on these parallel arterials are anticipated to range between 7% and 30% on US 50 and between 1% and 32% on US 29. Traffic volumes on eastbound I-66 are anticipated to decrease between 14% and 34% during the PM peak hour.

I-66 Corridor Traffic Volume Changes (2017 EB PM HOT-3+)			
Facility	**Screen Line**	**Peak Hour Volume Difference**	**% Change**
I-66	1C	-900	-33.5%
	2A	-820	-18.4%
	3C	-510	-14.3%
	4B	-750	-21.9%
	5B	-640	0.0%
US 29	1D	170	16.3%
	2C	105	11.3%
	3A	5	0.8%
	4A	215	31.9%
	--		
US 50	1E	325	22.8%
	2D	220	29.7%
	3E	90	6.6%
	4E	80	9.7%
	5D	105	0.0%
VA 7	1B	145	11.3%
	2B	5	0.3%
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VA 123	1F	280	12.3%
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	--		
	--		
	--		
Washington Blvd	3B	-10	-2.7%
	4C	65	7.7%
	--		
	--		
	--		
Wilson Blvd	3D	35	3.6%
	4D	30	4.3%
	5C	15	0.0%
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Table 7 - 2017 HOT-3+ Traffic Volume Changes by Screen Line (EB PM Peak Hour)

Figure 18 presents a visual summary of the traffic volume changes for the 2017 No-Build condition compared to the 2017 Build condition where westbound I-66 will operate as a HOT-3+ facility during the PM peak hour.

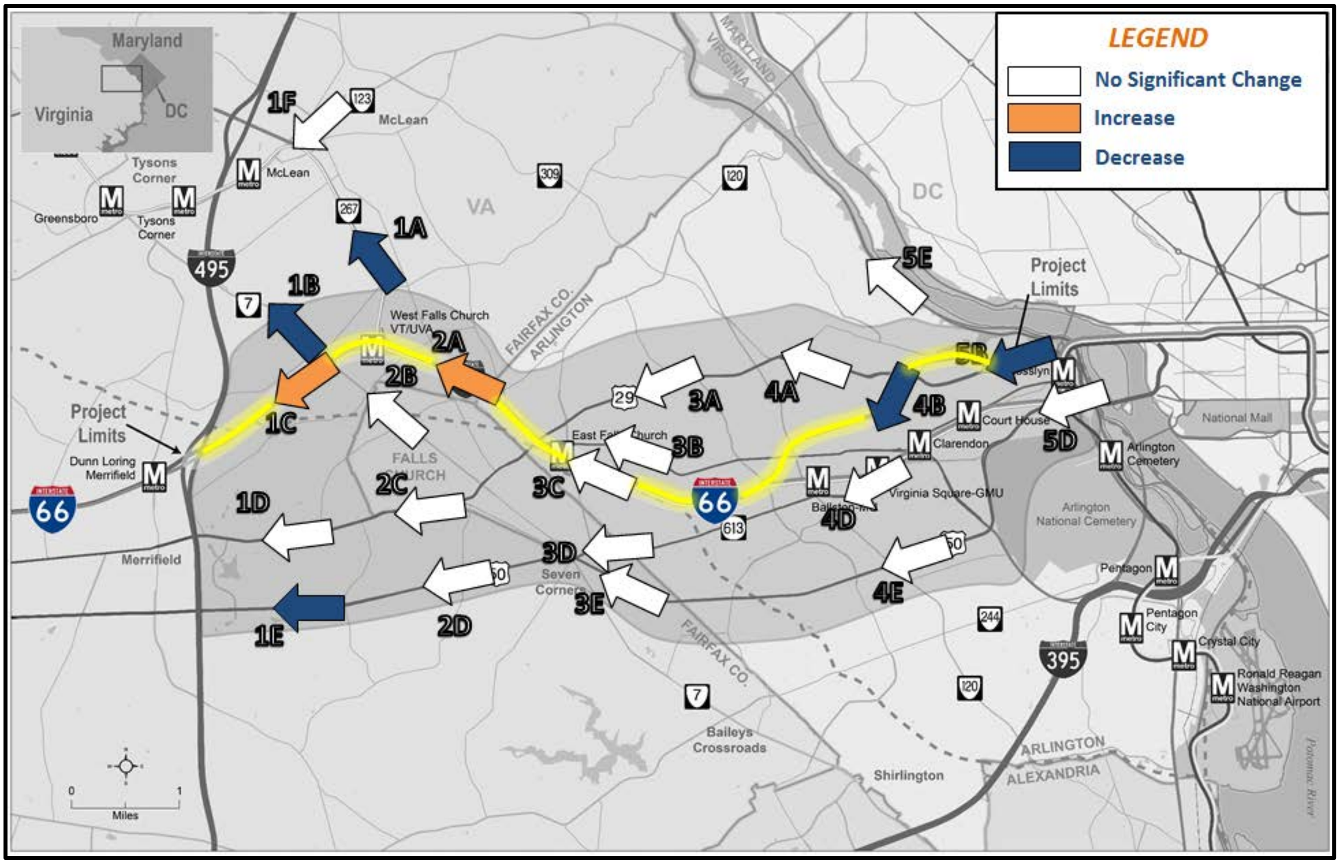

Figure 19 - 2017 HOT-3+ Traffic Volumes (WB PM Peak Hour)

Similar to the traffic volume changes forecasted on eastbound I-66 during the AM peak hour, the travel demand model results for the westbound PM peak hour revealed that in general, traffic volume changes within the I-66 study area are relatively minor as denoted by the white arrows. As shown in **Figure 19**, traffic volumes are forecasted to increase along the two western screen lines of I-66 with decreases along the two eastern screen lines of I-66 during the PM peak hour. Peak hour traffic volumes are also expected to decrease on VA 7, VA 267, and US 50 during the PM peak hour as a result of westbound I-66 operating as a dynamically priced toll lane facility.

Table 9 summarizes the peak hour differences in traffic volumes in terms of the numerical and percent changes between the 2017 No-Build and 2017 HOT-3+ Build scenarios. Westbound traffic volumes along the primary parallel arterials are expected to decrease during the PM peak hour, ranging between 2% and 4% on US 29 and between 1% and 4% on US 50. Westbound traffic volumes on I-66 are expected to increase along the western end of the project area, ranging between 6% near the Dulles Connector Road and 35% approaching I-495 during the PM peak hour.

I-66 Corridor Traffic Volume Changes (2017 WB PM HOT-3+)			
Facility	Screen Line	Peak Hour Volume Difference	% Change
I-66	1C	550	34.6%
	2A	250	6.1%
	3C	30	0.8%
	4B	-130	-4.1%
	5B	-135	0.0%
US 29	1D	-65	-3.4%
	2C	-50	-2.9%
	3A	-50	-4.1%
	4A	-35	-2.1%
	--	--	--
US 50	1E	-110	-3.9%
	2D	-85	-3.4%
	3E	-15	-0.5%
	4E	-5	-0.2%
	5D	-50	0.0%
VA 7	1B	-200	-13.7%
	2B	-20	-1.3%
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VA 123	1F	55	2.0%
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	--		
	--		
	--		
Washington Blvd	3B	5	2.0%
	4C	15	2.0%
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Wilson Blvd	3D	-70	-5.1%
	4D	10	1.0%
	5C	-70	0.0%
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Table 8 - 2017 HOT-3+ Traffic Volume Changes by Screen Line (WB PM Peak Hour)

6. PRELIMINARY TRAFFIC OPERATIONS ANALYSIS

As identified in the previous section, traffic patterns are anticipated to change as a result of converting I-66 to a dynamically priced toll lane facility in each direction during the AM and PM commuter periods. As a result, it is important to identify areas within the I-66 corridor that may experience degradations in traffic operations. As such, the project team utilized the travel forecasting model to calculate preliminary volume to capacity ratios (V/C), which identifies the amount of capacity a facility has to effectively process the traffic volume demands. This macroscopic view of the I-66 study area to establish relative changes in traffic operations between 2017 No-Build and the 2017 Build scenarios will be used to identify areas of concern for more detailed analyses. It is expected that potential areas of concern will be developed by the project team in conjunction with the local jurisdictions in order to ensure that the proposed project will not significantly impact the surrounding roadway network.

It is recognized that link V/C ratios may not provide the complete story of how a particular arterial may operate as a result of travel pattern shifts caused by changes in operation of a major facility such as I-66. Arterials such as US 29 and US 50 contain traffic signals that may be currently operating at poor or failing levels of service that cannot be accurately reflected in travel demand models. However, link V/C ratios can be useful in identifying upstream or downstream intersections where traffic operations may be negatively impacted by changes in traffic volumes. Increases in volume, and subsequent V/C ratios, on a particular link will most likely travel through a signalized intersection along parallel routes such as US 29 or US 50. If these signalized intersections are already operating at or near capacity, any additional volume demands may degrade the traffic operations at these locations even further. It is at these locations that the project team will coordinate with the local jurisdictions to identify additional traffic analysis efforts.

It is also recognized by the project team that the results presented in this technical memorandum are preliminary in nature; however, any changes in the final forecasted traffic volumes are not expected to deviate significantly or result in differing conclusions than what are presented in this study.

Figure 19 below presents a visual summary of the 2017 No-Build AM peak hour link V/C ratios calculated from the travel forecasting model for each of the screen line locations used in the future traffic volume analysis. For the purpose of this analysis, 40 screen lines were identified for comparison between 2017 No-Build and Build conditions (20 locations, 2 directions per location).

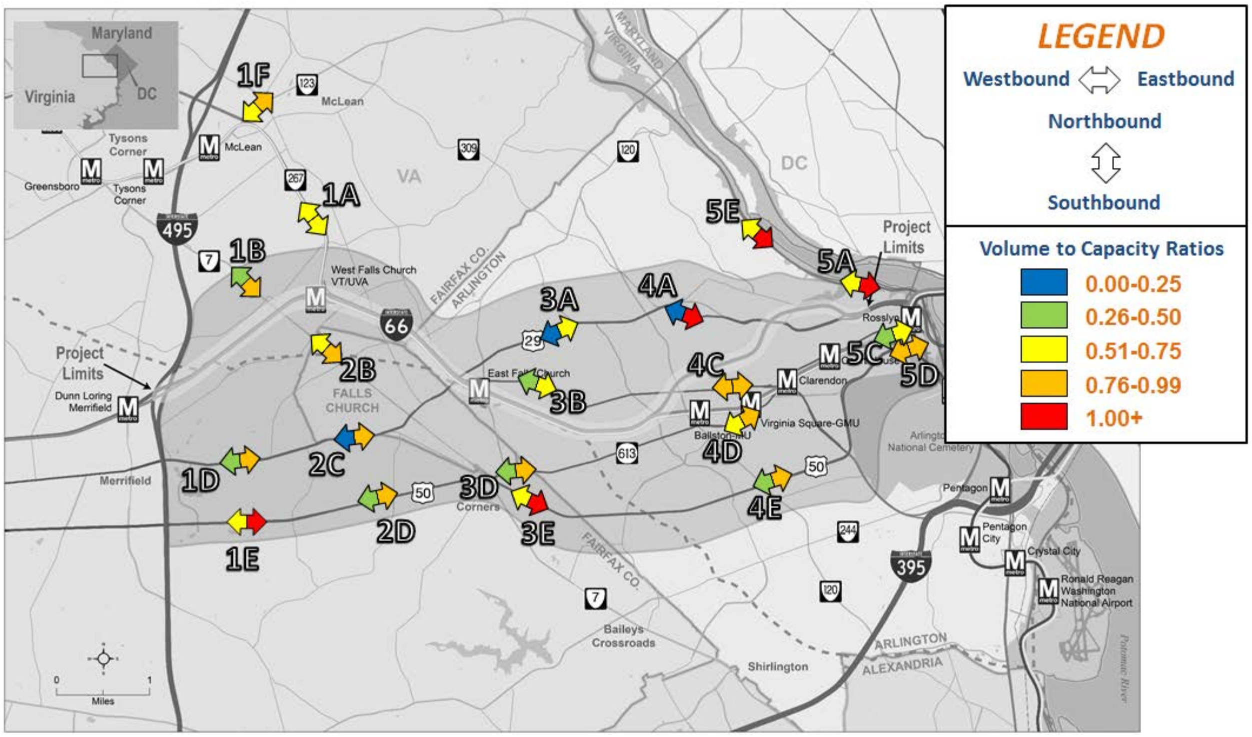

Figure 20 - 2017 No-Build Link V/C Summary (AM Peak Hour)

As shown in **Figure 20**, five screen line locations are forecasted to exceed the available capacity on the given arterial. These locations include:

- **Screen Line 1E:** EB US 50 between Jaguar Trail and Allen Street
- **Screen Line 3E:** EB US 50 between Patrick Henry Drive and Olin Drive
- **Screen Line 4A:** EB US 29 between N Pollard Street and Oakland Street
- **Screen Line 5A:** EB George Washington Parkway between Spout Run Parkway and the Key Bridge
- **Screen Line 5E:** EB George Washington Parkway between Glebe Road and Spout Run Parkway

Figure 20 below presents a visual summary of the 2017 Build HOT-2+ AM peak hour link V/C ratios calculated from the travel forecasting model for each of the screen line locations used in the future traffic volume analysis.

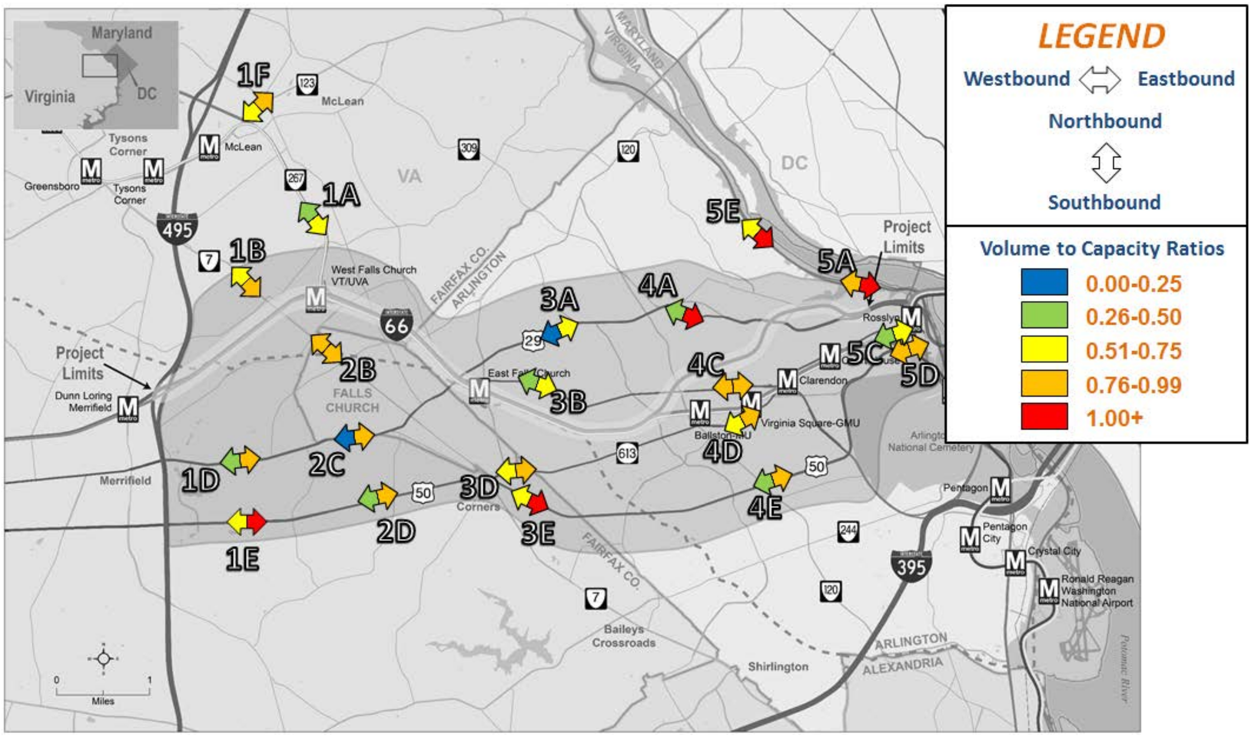

Figure 21 - 2017 Build HOT-2+ Link V/C Summary (AM Peak Hour)

As shown in **Figure 21**, the five eastbound screen line locations identified as operating over capacity during 2017 No-Build conditions are expected to continue to operate over capacity during the 2017 Build HOT-2+ scenario. The remaining screen line locations are forecasted to operate under capacity as a result of the project.

Figure 22 below presents a summary of the impacts to link V/C ratios, comparing 2017 No-Build and 2017 Build HOT-2+ operating conditions during the AM peak hour.

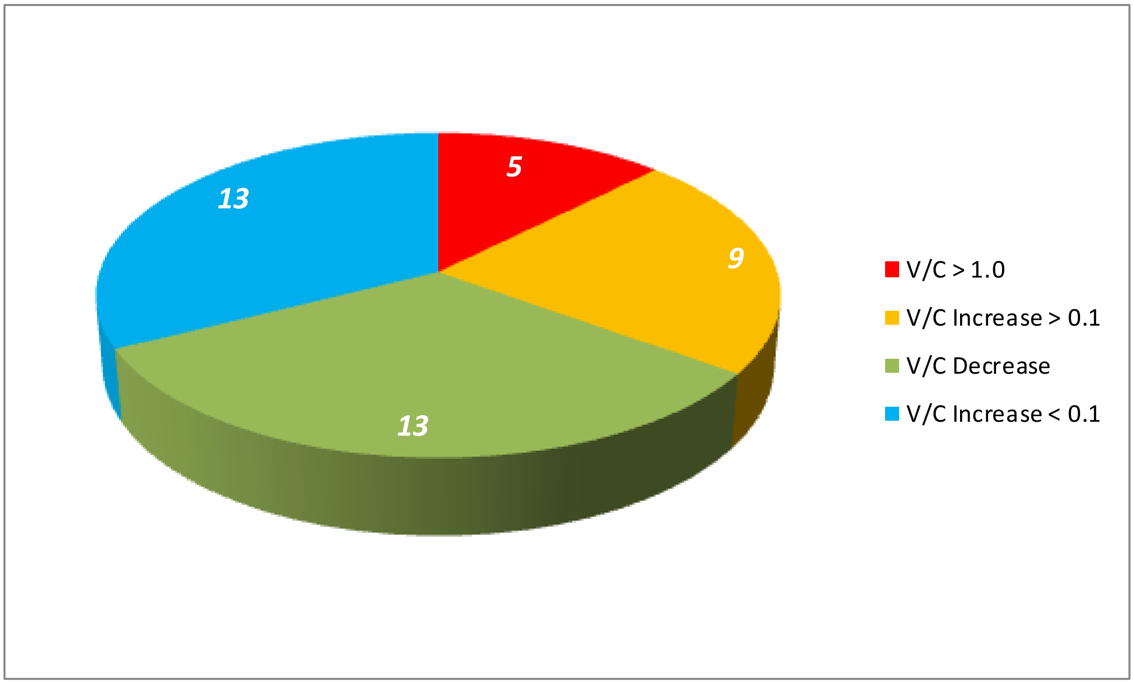

Figure 22 - 2017 HOT-2+ Traffic Operations Impacts (AM Peak Period)

As shown in **Figure 22**, the conversion of I-66 to a dynamically priced toll lane facility results in nine screen line locations showing an increase in V/C ratios of greater than 0.1, meaning that these particular locations have less capacity resulting from the Build condition than the No-Build condition during the AM peak hour. However, these screen line locations are still expected to operate with sufficient capacity to handle the anticipated traffic volume demands during the AM peak hour. Furthermore, 26 screen line locations are anticipated to have a decrease or an increase in V/C ratios of less than 0.1, meaning that there is more capacity to handle future traffic volumes during the Build condition than the No-Build condition or impacts to future operations are expected to be negligible.

Figure 23 presents a visual summary of the 2017 No-Build PM peak hour link V/C ratios calculated from the travel forecasting model for each of the identified arterial screen line locations.

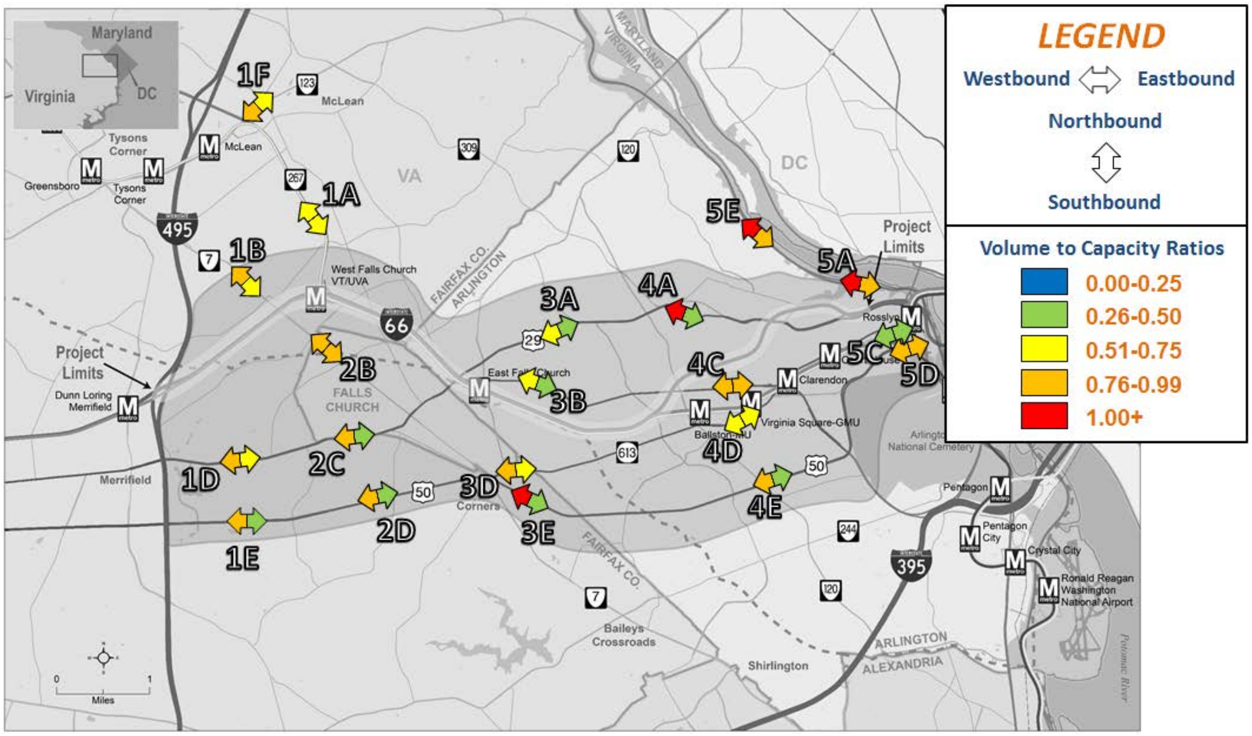

Figure 23 - 2017 No-Build Link V/C Summary (PM Peak Hour)

As summarized in **Figure 23**, four screen line locations are forecasted to exceed the available capacity on the given arterial. These locations include:

- **Screen Line 3E:** WB US 50 between Patrick Henry Drive and Olin Drive
- **Screen Line 4A:** WB US 29 between N Pollard Street and Oakland Street
- **Screen Line 5A:** WB George Washington Parkway between Spout Run Parkway and the Key Bridge
- **Screen Line 5E:** WB George Washington Parkway between Glebe Road and Spout Run Parkway

Figure 24 below presents a visual summary of the 2017 Build HOT-2+ PM peak hour link V/C ratios calculated from the travel forecasting model for each of the screen line locations used in the future traffic volume analysis.

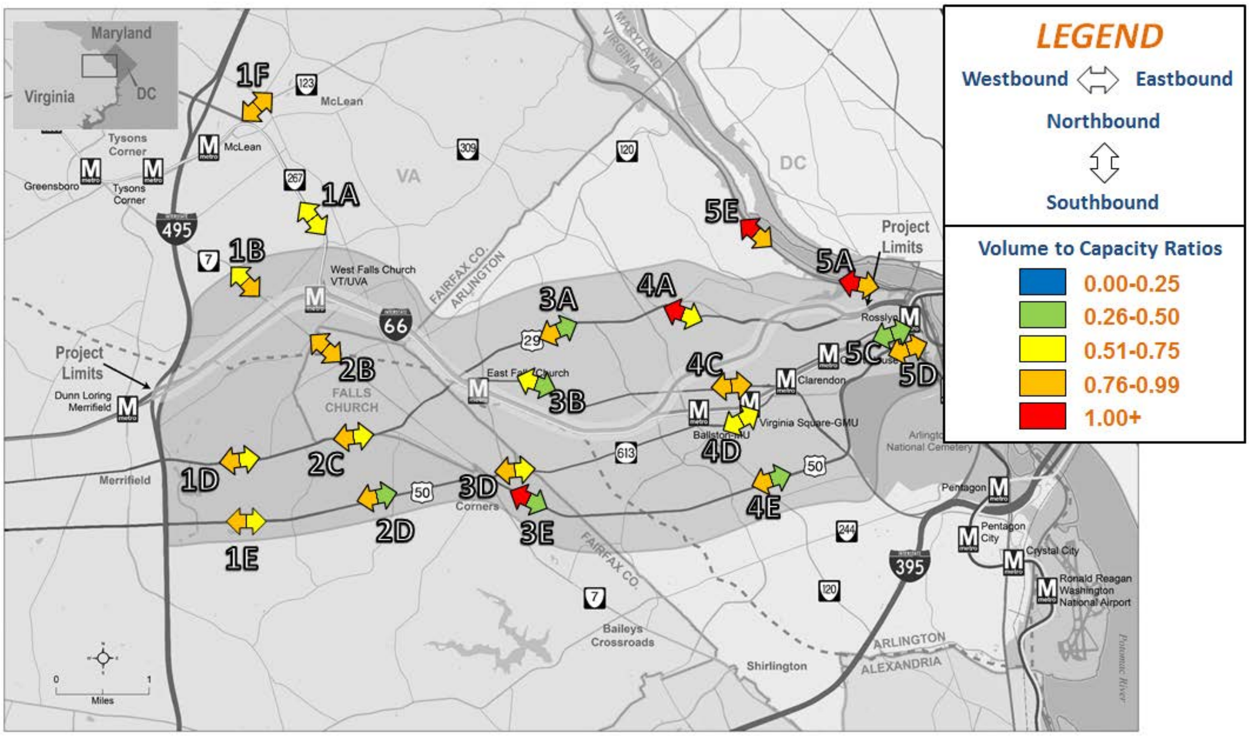

Figure 24 - 2017 Build HOT-2+ Link V/C Summary (PM Peak Hour)

As shown in **Figure 24**, the four westbound screen line locations identified as operating over capacity during 2017 No-Build conditions are expected to continue to operate over capacity during the 2017 Build HOT-2+ scenario. Similar to the AM peak hour results, the remaining screen line locations are forecasted to operate under capacity as a result of the project.

Figure 25 below presents a summary of the impacts to link V/C ratios, in terms of comparing increases or decreases in link V/C ratios between 2017 No-Build and 2017 Build HOT-2+ scenarios during the PM peak hour.

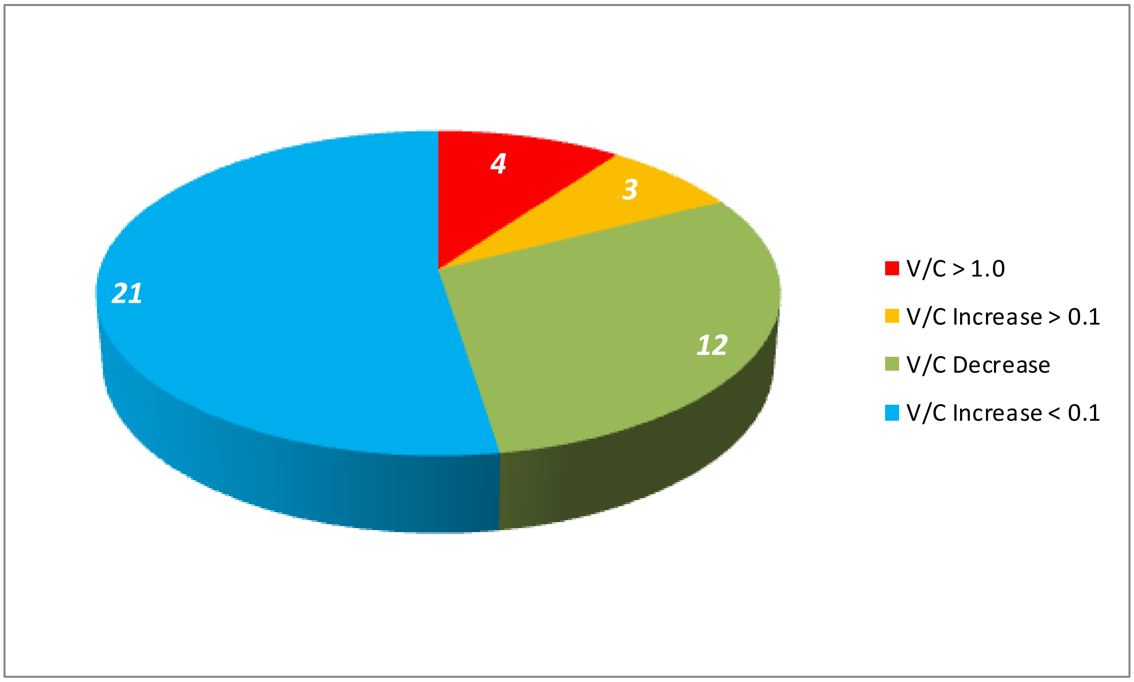

Figure 25 - 2017 HOT-2+ Traffic Operations Impacts (PM Peak Period)

As shown in **Figure 25**, the conversion of I-66 to a dynamically priced toll lane facility results in three screen line locations showing an increase in V/C ratios of greater than 0.1. From the travel demand model, these screen line locations are still expected to operate with sufficient capacity to handle the anticipated traffic volume demands during the PM peak hour. 33 screen line locations are anticipated to have a decrease or an increase in V/C ratios of less than 0.1 during the PM peak hour as a result of the project.

Figure 26 below presents a visual summary of the 2017 Build HOT-3+ AM peak hour link V/C ratios calculated from the travel forecasting model for each of the screen line locations used in the future traffic volume analysis.

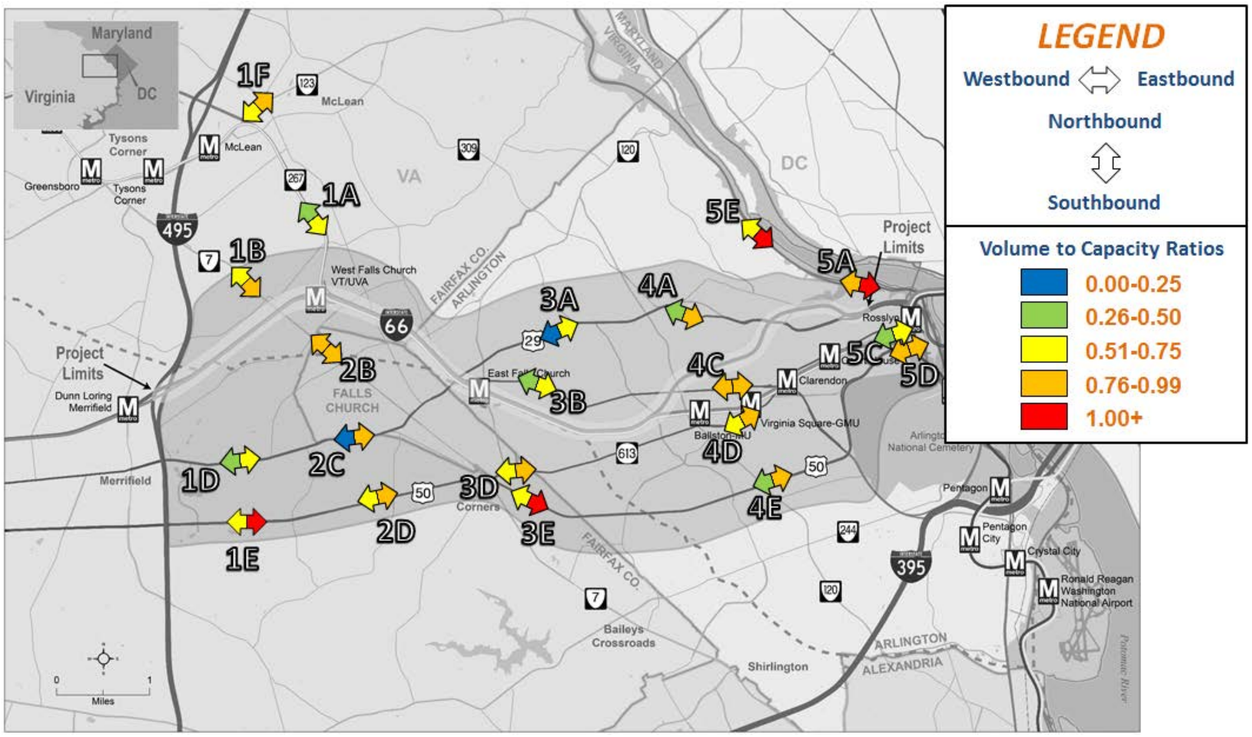

Figure 26 - 2017 Build HOT-3+ Link V/C Summary (AM Peak Hour)

As noted in **Figure 20** above, five eastbound screen line locations were identified as over capacity during 2017 No-Build operating conditions during the AM peak hour. However, as shown in **Figure 26**, four of these eastbound screen line locations are expected to continue to operate over capacity during the 2017 Build HOT-3+ scenario. The eastbound US 29 screen line location (Screen Line 4A) is anticipated to operate just below capacity as a result of the 2017 Build HOT-3+ scenario during the AM peak hour. The remaining screen line locations are forecasted to operate under capacity as a result of the project.

Figure 27 below presents a summary of the impacts to link V/C ratios, comparing 2017 No-Build and 2017 Build HOT-3+ operating conditions during the AM peak hour.

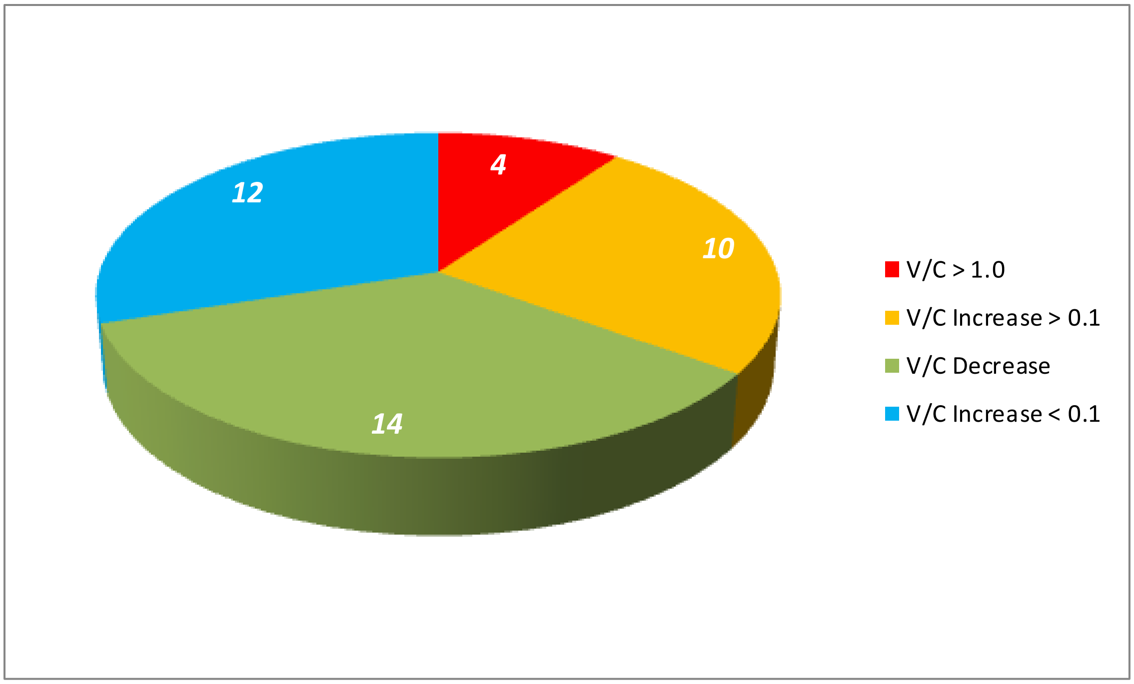

Figure 27 - 2017 HOT-3+ Traffic Operations Impacts (AM Peak Period)

As shown in **Figure 27**, the conversion of I-66 to a dynamically priced toll lane facility results in ten screen line locations showing an increase in V/C ratios of greater than 0.1, meaning that these particular locations have less capacity resulting from the Build condition than the No-Build condition during the AM peak hour. However, these screen line locations are still expected to operate with sufficient capacity to handle the anticipated traffic volume demands during the PM peak hour. Furthermore, 26 screen line locations are anticipated to have a decrease or minimal increases in V/C ratios, meaning that there is more capacity to handle future traffic volumes during the Build condition than the No-Build condition or impacts to future operations are expected to be negligible.

Figure 28 below presents a visual summary of the 2017 Build HOT-3+ PM peak hour link V/C ratios calculated from the travel forecasting model for each of the screen line locations used in the future traffic volume analysis.

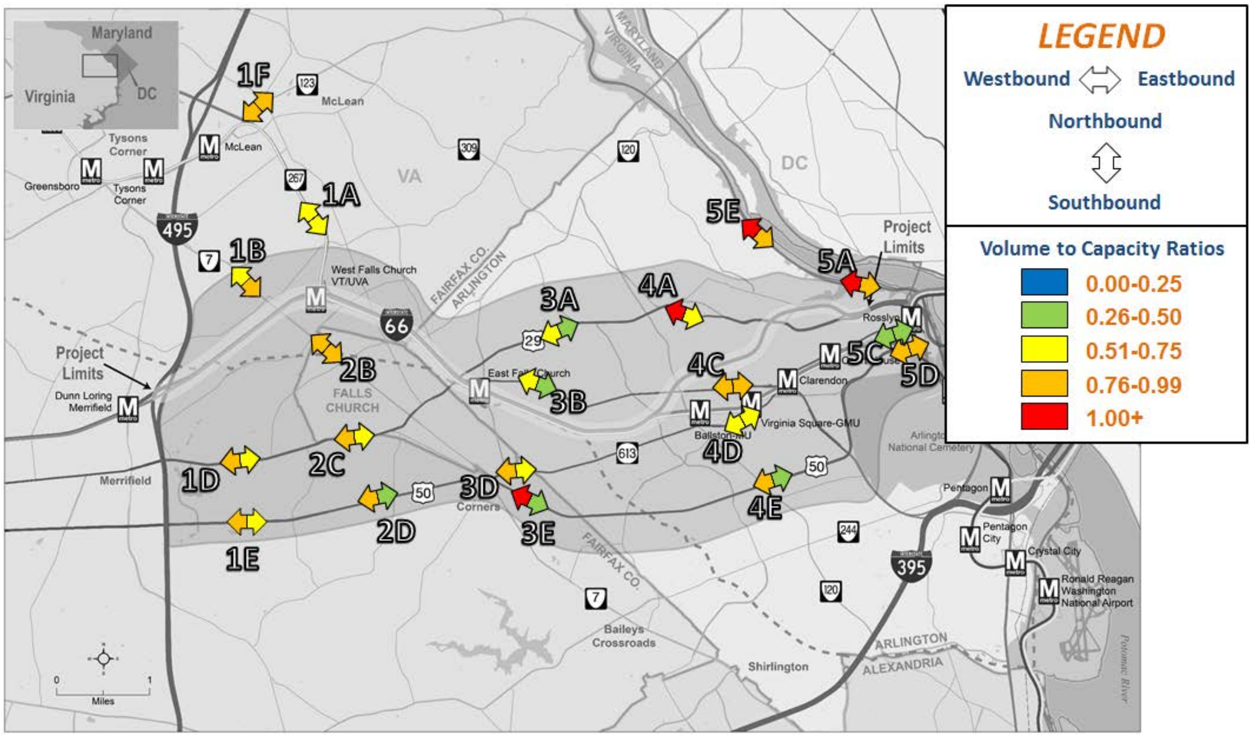

Figure 28 - 2017 Build HOT-3+ Link V/C Summary (PM Peak Hour)

As shown in **Figure 28**, the four screen line locations identified as operating over capacity during 2017 No-Build conditions are expected to continue to operate over capacity during the 2017 Build HOT-3+ scenario. The remaining screen line locations are forecasted to operate under capacity as a result of the project during the PM peak hour.

Figure 29 below presents a summary of the impacts to link V/C ratios, comparing 2017 No-Build and 2017 Build HOT-3+ operating conditions during the PM peak hour.

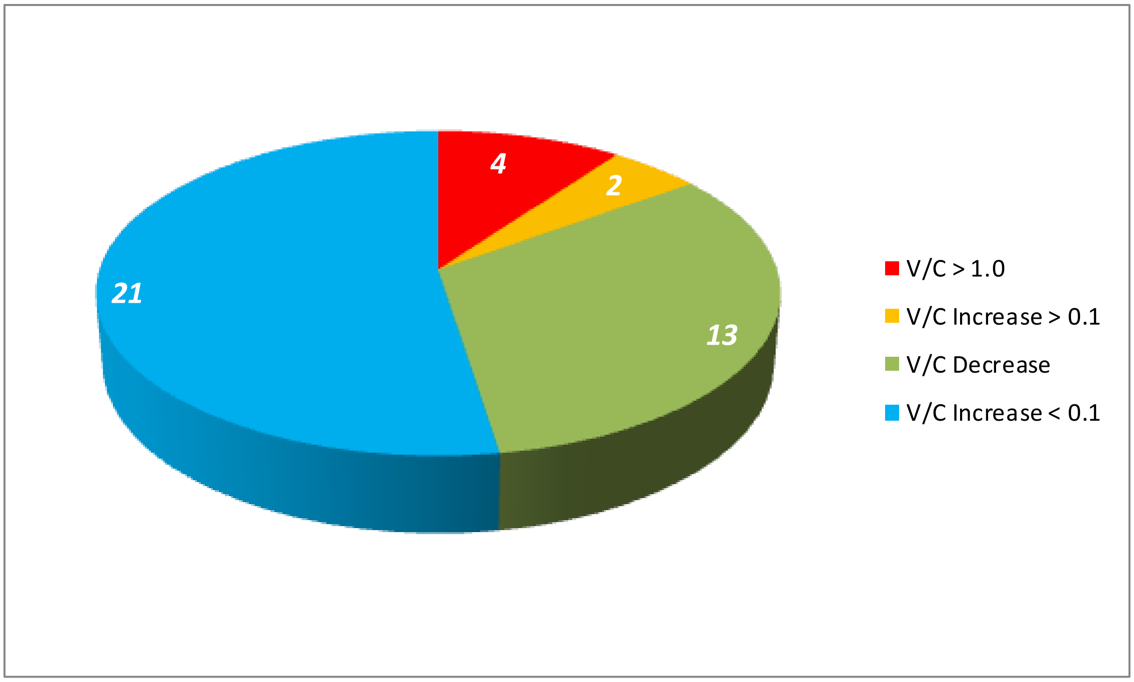

Figure 29 - 2017 HOT-3+ Traffic Operations Impacts (PM Peak Period)

As shown in **Figure 28**, the conversion of I-66 to a dynamically priced toll lane facility results in two screen line locations showing an increase in V/C ratios of greater than 0.1. However, these screen line locations are still expected to operate with sufficient capacity to handle the anticipated traffic volume demands during the PM peak hour under the HOT-3+ operating scenario. Furthermore, 34 screen line locations are anticipated to have a decrease or minimal increases in V/C ratios during the PM peak hour as a result of the project.

7. PRELIMINARY TRAVEL TIME AND SPEED DATA

During any given week, travel time and speeds on I-66 can vary widely depending on the time of day, prevailing weather conditions, or excessive vehicular demands on the facility during the peak AM and PM commuting periods. As part of data collection efforts for this study, travel time runs were conducted on I-66 in both directions during the AM and PM peak commuting periods in order to establish baseline operating conditions from which the travel demand model has been calibrated against. Using the calibrated baseline travel demand model, corridor travel speeds were calculated from the model for each of the two Build scenarios analyzed for this study. The following figures present a summary of the existing speeds versus anticipated travel speeds for the HOT-2+ and HOT-3+ Build scenarios.

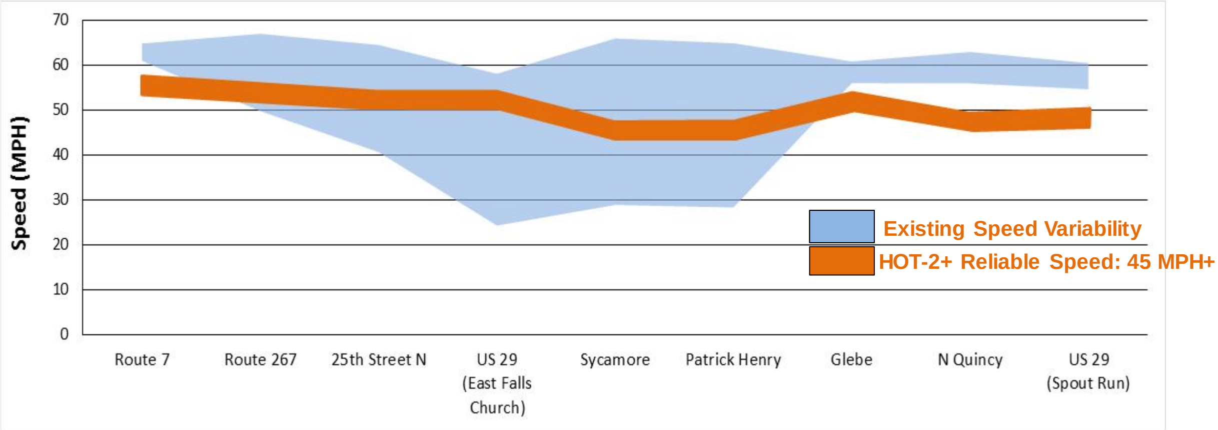

Figure 30 - 2017 Existing vs. HOT-2+ Build Speed Comparison (EB AM)

As shown in **Figure 30**, existing eastbound AM travel speeds can vary between nearly 30 MPH at US 29 (East Falls Church) to nearly 65 MPH between VA 7 and VA 267 as highlighted by the blue shading. By converting eastbound I-66 to a dynamically priced toll lane facility during the AM peak period, the anticipated travel speeds (denoted by the orange line) range between nearly 50 MPH and 60 MPH. By narrowing the range of travel speeds along the corridor, disruptions in the traffic stream can be minimized thus allowing a steadier flow of traffic through the corridor than what is currently experienced on eastbound I-66 during the AM peak period.

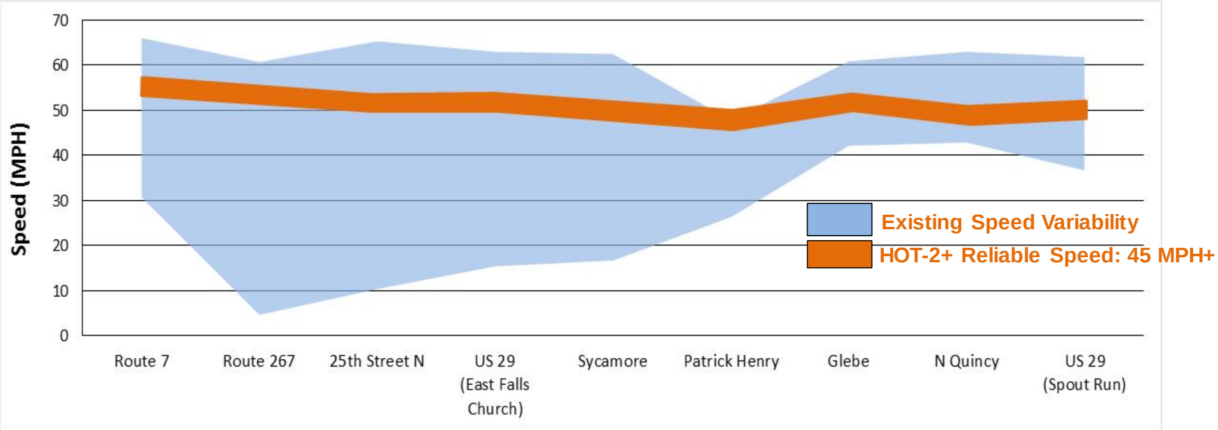

Figure 31 - 2017 Existing vs. HOT-2+ Build Speed Comparison (EB PM)

As shown in **Figure 31**, existing eastbound PM travel speeds can vary between nearly 5 MPH at VA 267 to nearly 65 MPH at VA 7 as highlighted by the blue shading. By converting eastbound I-66 to a dynamically priced toll lane facility during the PM peak period, the anticipated travel speeds (denoted by the orange line) range between nearly 45 MPH and 60 MPH.

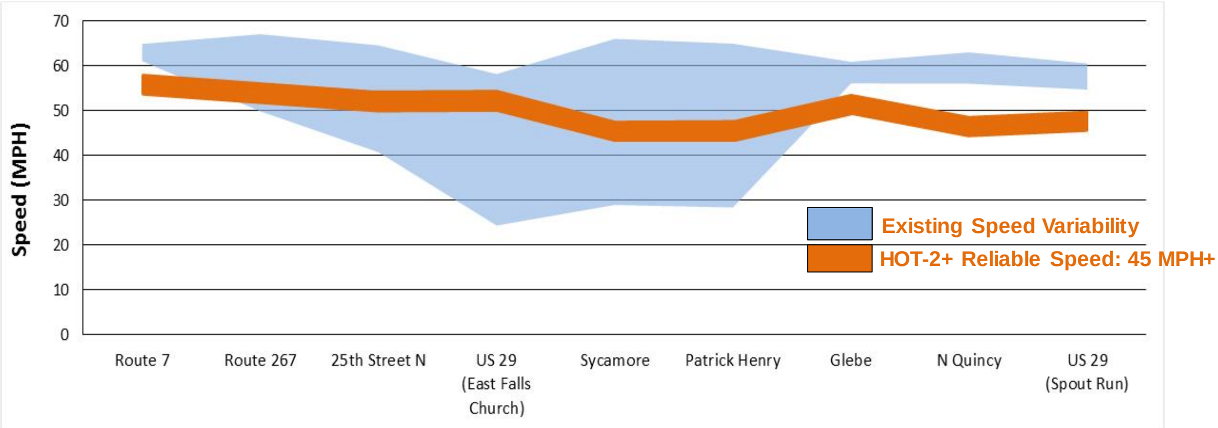

Figure 32 - 2017 Existing vs. HOT-3+ Build Speed Comparison (EB AM)

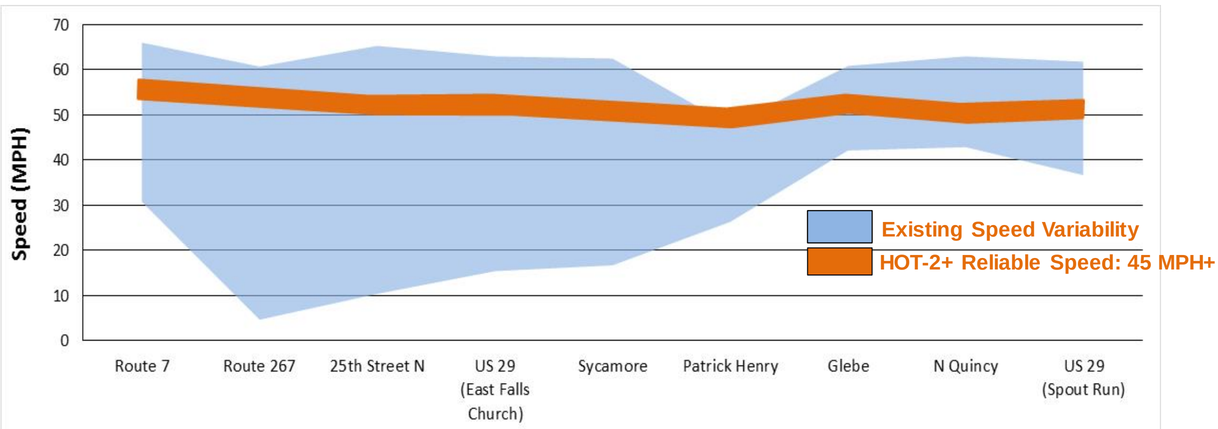

Figure 33 - 2017 Existing vs. HOT-3+ Build Speed Comparison (EB PM)

As shown in **Figure 32 and Figure 33**, existing eastbound AM and PM travel speeds can vary widely along the corridor as highlighted by the blue shading. Similar to the HOT-2+ Build scenario, by converting eastbound I-66 to a dynamically priced toll lane facility (HOT-3+) during the AM and PM peak periods, the anticipated travel speeds (denoted by the orange line) range between nearly 50 MPH and 60 MPH.

8. PRELIMINARY TOLL RATES

For the purpose of this study, the travel demand model used to determine future traffic volumes on the I-66 dynamically priced toll lanes was also used to determine the anticipated toll rates users can expect to pay for access to the facility. The toll rate calculations within the future year models include a toll diversion module that uses the following procedure:

- A logit choice function is utilized to calculate the probability of users utilizing the dynamically priced toll lanes.
- The logit choice function includes cost and time coefficients that imply users' value of time (VOT).
- Value of time is different for each market segment based on their trip purpose and it changes through time based on income growth for the region.

- Values of time (2014$/hr) used in the I-66 inside the Beltway Toll & Revenue study for 2017, 2021, and 2040 trip purposes are shown in **Table 10** below:
  - HBW – Home Based Work trip
  - HBO – Home Based Other trip
  - NHW – Non Home Based trip
  - Medium trucks and small trucks are included per project assumptions

  The annual VOT escalation rate was validated by examining the projected real median household income growth. Using projected nominal median household income (source: Moody's Analytics) as calculated for the Project corridor, along with consumer price index (CPI) data (source: Moody's Analytics), a series of median household incomes in 2014 dollars was calculated. The analysis shows that in the past few decades there has been a real term income decrease, during which recessions also took place. The VOT drop until 2021 is arguably due to the remnants of the recent recession of 2007 to 2009.

- The toll diversion module utilizes travel time savings between the dynamically priced toll lanes and other alternatives in conjunction with values of time to calculate the toll rates that maximize throughput on the I-66 corridor.
- Assigned trips are fed back into the toll diversion module to calculate new time savings until equilibrium is reached and final toll rates for each time period are determined.

	2017	2021	2040
HBW	$22.30	$21.90	$23.00
HBO	$19.10	$18.80	$19.70
NHW	$23.60	$23.20	$24.30
Truck	$23.60	$23.20	$24.30

Table 9 - Values of Time by Trip Purpose

Based on the steps outlined above, the preliminary anticipated toll rates are summarized in **Table 11** below. The toll rates listed below represent the average toll rates across the entire AM and PM peak periods for a full length trip along I-66 between I-495 and US 29 (Spout Run). Actual toll rates may be higher or lower than those shown in **Table 11** depending on actual peak demand for access to the facility. Furthermore, travelers that use I-66 for a shorter trip within the project area may be charged a lower toll rate than what is shown below.

Toll Scenarios	Peak Direction Commute		Reverse Commute	
	Eastbound AM	Westbound PM	Westbound AM	Eastbound PM
2017 **SOV – Pays the Toll** **HOV2+ rides for FREE**	**$9.00**	**$8.00**	**$1.00**	**$2.00**
2017 **SOV/HOV2 – Pays the Toll** **HOV3+ rides for FREE**	**$7.00**	**$6.00**	**$1.00**	**$1.00**
2021 **SOV/HOV2 - Pays the Toll** **HOV3+ rides for FREE**	**$7.00**	**$6.00**	**$1.00**	**$1.00**

Table 10 - Preliminary Toll Rates

9. CONCLUSIONS

Based on the travel demand modeling and traffic analysis efforts to date, the following preliminary conclusions can be made regarding the conversion of I-66 to a dynamically priced toll lane facility in each direction during the AM and PM peak commuter periods:

- **Peak period/peak direction travel patterns will not change significantly**
  - Traffic volumes for the traditional commute (eastbound AM/westbound PM) will not be significantly impacted by the proposed project. Diversion between I-66 and the parallel arterials are expected to be minimal.
- **Modest diversion to parallel arterials**
  - The results from the travel demand model indicates that traffic may divert from I-66 to US 50 for westbound trips during the AM peak hour and eastbound trips during the PM peak hour.
  - Diversion to other parallel routes such as US 29, Wilson Boulevard, and Washington Boulevard, is also forecasted but with lower peak hour volumes than expected to divert onto US 50.
- **Diverted traffic to parallel arterials will not significantly impact traffic operations**
  - Based on V/C calculations within the travel demand model, links expected to experience an increase in traffic volumes as a result of the project have the ability to sufficiently handle the increased demand without significant impacts to traffic operations.
  - Links that are expected to operate over capacity during future No-Build conditions will not degrade further as a result of the proposed project.
- **Travel speed will be more reliable as a result of the project**
  - Travel speeds as a result of the project will range between 45 MPH and 60 MPH depending on the Build scenario to be implemented. With existing speeds ranging from as low as 5 MPH and as high as 65 MPH on some segments of I-66, providing a consistent, reliable speed along the corridor will minimize traffic flow disruptions and provide increased ability to move more people through the corridor.