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MARYLAND

I-495 & I-270 Managed Lanes Study

APPENDIX A
FINAL TRAFFIC ANALYSIS TECHNICAL REPORT
June 2022

U.S. Department
of Transportation
**Federal Highway
Administration**

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

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1 INTRODUCTION

1.1 Overview

The Federal Highway Administration (FHWA), as the Lead Federal Agency, and the Maryland Department of Transportation State Highway Administration (MDOT SHA), as the Local Project Sponsor, are preparing a Final Environmental Impact Statement (FEIS) in accordance with the National Environmental Policy Act (NEPA) for the I-495 & I-270 Managed Lanes Study (Study). The I-495 & I-270 Managed Lanes Study (Study) is the first environmental study under the broader I-495 & I-270 Public-Private Partnership (P3) Program.

This Final Traffic Analysis Technical Report has been prepared to support the FEIS and focuses on the analysis of the Preferred Alternative. The Preferred Alternative, also referred to as Alternative 9 – Phase 1 South, includes building a new American Legion Bridge and delivering two high-occupancy toll (HOT) managed lanes in each direction on I-495 from the George Washington Memorial Parkway in Virginia to east of MD 187 on I-495, and on I-270 from I-495 to north of I-370 and on the I-270 eastern spur from east of MD 187 to I-270. Refer to **Figure 1-1**. This Preferred Alternative was identified after extensive coordination with agencies, the public and stakeholders to respond directly to feedback received on the DEIS to avoid displacements and impacts to significant environmental resources, and to align the NEPA approval with the planned project phased delivery and permitting approach.

The purpose of the Final Traffic Analysis Technical Report is to present the existing conditions and an assessment of potential direct impacts of the Preferred Alternative. This Final Traffic Analysis Technical Report builds upon the analysis in the Draft Traffic Analysis Technical Report, DEIS and Supplemental DEIS (SDEIS), and has been prepared to support and inform the FEIS.

1.2 Study Corridors and the Preferred Alternative

In the SDEIS, published on October 1, 2021, FHWA and MDOT SHA identified the Preferred Alternative: Alternative 9 – Phase 1 South to be consistent with the previously determined phased delivery and permitting approach, which focuses on Phase 1 South. As a result, Alternative 9 – Phase 1 South includes the same improvements proposed as part of Alternative 9 in the DEIS but focuses the build improvements within the Phase 1 South limits only. The limits of Phase 1 South are along I-495 from the George Washington Memorial Parkway to east of MD 187 and along I-270 from I-495 to north of I-370 and on the I-270 east and west spurs as shown in **dark blue** in **Figure 1-1**. The improvements include two new HOT managed lanes in each direction along I-495 and I-270 within the Phase 1 South limits. There is no action, or no improvements included at this time on I-495 east of the I-270 east spur to MD 5 (shown in **light blue** in **Figure 1-1**). While the Preferred Alternative does not include improvements to the remaining parts of I-495 within the Study limits, improvements on the remainder of the interstate system may still be needed in the future. Any such improvements would advance separately and would be subject to additional environmental studies and analysis and collaboration with the public, stakeholders and agencies.

The 48-mile corridor Study limits remain unchanged: I-495 from south of the George Washington Memorial Parkway in Fairfax County, Virginia, to west of MD 5 and along I-270 from I-495 to north of I-370, including the east and west I-270 spurs in Montgomery and Prince George's Counties, Maryland (shown in both dark and light blue in **Figure 1-1**).

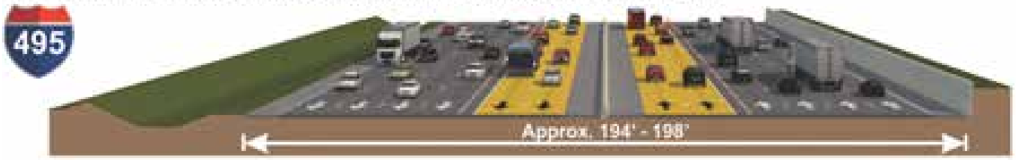
Figure 1-1: I-495 & I-270 Managed Lanes Study Corridors – Preferred Alternative

1.3 Description of the Preferred Alternative

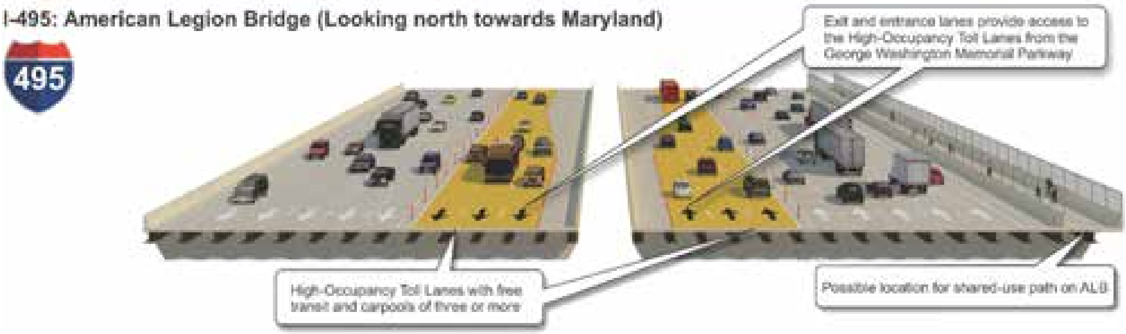
The Preferred Alternative includes a two-lane HOT managed lanes network on I-495 and I-270 within the limits of Phase 1 South only (**Figure 1-2**). On I-495, the Preferred Alternative consists of adding two, new HOT managed lanes in each direction from the George Washington Memorial Parkway to east of MD 187. On I-270, the Preferred Alternative consists of converting the one existing HOV lane in each direction to a HOT managed lane and adding one new HOT managed lane in each direction on I-270 from I-495 to north of I-370 and on the I-270 east and west spurs. There is no action, or no improvements included at this time on I-495 east of the I-270 east spur to MD 5. Along I-270, the existing collector-distributor (C-D) lanes from Montrose Road to I-370 would be removed as part of the proposed improvements. The managed lanes would be separated from the general purpose lanes using flexible delineators placed within a buffer. Transit buses and HOV 3+ vehicles would be permitted to use the managed lanes toll-free.

Figure 1-2: Preferred Alternative Typical Sections (HOT Managed lanes Shown in Yellow)

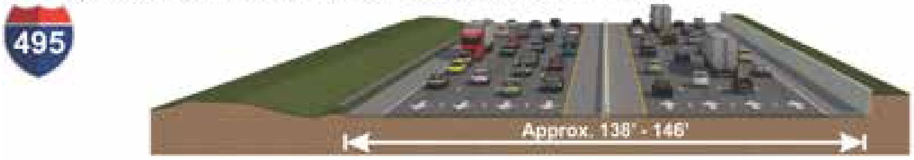
I-495 from the George Washington Memorial Parkway to east of MD 187



I-495: American Legion Bridge (Looking north towards Maryland)



I-495 east of MD 187 to west of MD 5 - NO ACTION AT THIS TIME



I-270 from I-495 to I-370

2 DEVELOPMENT AND CALIBRATION OF BASELINE TRAFFIC MODELS

The following sections detail the process of developing and then calibrating the models used in this Study. The development and calibration of any model is necessary to ensure that future models accurately reflect existing congestion patterns and vehicle behaviors. Model validation and calibration refers to the process that confirms the model can provide a reasonable approximation of real-world conditions (validation) and refines the model as necessary to bring it within desired validation targets (calibration). This process ensures that the model accurately represents existing traffic conditions prior to data being reported for analysis purposes.

Calibration thresholds can fluctuate depending on the nature of the project, precision of available inputs, and the needs and resources of the agency. However, MDOT SHA has well-established methods for calibration as documented in its VISSIM Modeling Document (MDOT SHA November 2016, Updated August 2017). This document is provided online[1] for anyone to use in their model calibration efforts, thus ensuring a level of consistency by all traffic modelers in the state. The guidance requires that calibration be focused on data-driven criteria to confirm that models reflect existing vehicle behaviors and congestion patterns experienced in the system being analyzed.

This Chapter summarizes the calibration efforts conducted when developing the baseline traffic models for use in the DEIS. Additional calibration documentation was required to satisfy Interstate Access Point Approval guidelines. Refer to *MDOT SHA's Application for Interstate Access Point Approval* in **FEIS, Appendix B**, for additional information and details.

2.1 Model Area Limits

The first step in developing a model is defining its geographical limits and the roadways to be included in the model. As the Study is considering improvements along I-495, I-270, and its interchanges, the model development begins with determining the limits of these freeways to be included.

A. I-495 Description

I-495 is a 64-mile circular freeway that runs through Maryland and Virginia and around the District of Columbia and includes 42 miles in Maryland. I-495 provides access to several roadways in the Washington, DC area, including:

- I-95, which runs along the east coast of the United States from Maine to Florida,
- I-270, which connects the Washington, DC area to Frederick County and western Maryland,
- US 29 and MD 295 (Baltimore-Washington Parkway), which provide connections from the Washington, DC Maryland suburbs to the Baltimore region,
- US 50, which provides access to Annapolis and the Eastern Shore, and
- MD 5, which provides access to southern Maryland.

For a 25-mile section in Prince George's County from the I-495/I-95 interchange to the Woodrow Wilson Bridge, I-495 runs concurrent with I-95. Barrier-separated Collector-Distributor (CD) lanes are present

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[1] https://www.roads.maryland.gov/OPPEN/VISSIM%20Modeling%20Guidance%209-12-2017.pdf

along the Inner Loop from I-95 to US 1, and in both directions from north of MD 202 to Arena Drive and from MD 210 to the Woodrow Wilson Bridge. The posted speed limit along I-495 is 55 mph.

B. I-270 Description

I-270 is a 32-mile freeway that runs from I-495 in the southeast to I-70 in the northwest, near Frederick, Maryland. North of I-70, this roadway becomes US 15, which continues north into Pennsylvania. I-270 primarily serves as a commuter route to the Washington, DC area from Frederick County and the communities along the corridor. Two miles north of I-495, I-270 splits into an East Spur and a West Spur. Both directions of I-270 include High Occupancy Vehicle (HOV) and CD lanes. The I-270 Southbound HOV lane begins north of I-370 and ends between MD 187 and MD 355 along the East Spur and at the I-270 and I-495 merge along the West Spur. The I-270 Northbound HOV lane begins where lanes for I-270 from I-495 form, between MD 190 and the I-270 West Spur on the I-495 Inner Loop and along the ramp from I-495 to the I-270 East Spur on the I-495 Outer Loop. The HOV lanes are in service weekdays from 6:00-9:00 AM in the southbound direction and 3:30-6:30 PM in the northbound direction. General traffic may use these lanes at other times. The HOV lanes are designated HOV 2+, meaning two or more people must occupy the vehicle. Motorcycles and emergency vehicles (during an emergency) are also permitted in these lanes. Additionally, plug-in electric and plug-in hybrid electric vehicles registered in Maryland are permitted to drive in the HOV lanes with only one occupant. The CD lanes run along I-270 Southbound from north of I-370 to south of Montrose Road, and along I-270 Northbound from south of Montrose Road to north of MD 124. The CD lanes are barrier separated, and the number of lanes vary along the corridor. The HOV lanes are not barrier-separated. The posted speed limit along I-270 is 55 mph from I-495 (both spurs) to MD 121, 65 mph from MD 121 to MD 85, and 55 mph from MD 85 to I-70.

C. Corridors Modeling Limits

While the NEPA limits of the Study extend along I-270 from I-495 to north of I-370 and along I-495 from south of the George Washington Memorial Parkway in Virginia to west of MD 5 in Maryland, as previously shown in **Figure 1-1**, all modeling efforts for the Final Technical Analysis Traffic Report were extended to the following limits:

- I-495 from VA 193 in Virginia to the Woodrow Wilson Bridge on the Maryland side
- I-270 from the I-70 ramp merges to I-495, including the East and West Spurs

Extending the modeling to these limits ensures that the model accounts for effects of congestion originating outside the NEPA limits that impact the freeway segments within the NEPA limits, and that it captures the full extent of congestion both within the NEPA limits as well as outside of the NEPA limits that impact the Study area. Every existing interchange along I-495 and I-270 within these modeling limits was included in the modeling analysis. Construction of the interchange at I-270 at Watkins Mill Road has been completed and the project was opened to traffic in June 2020; the interchange was included in all future models. The modeled network includes a total of 50 interchanges: 29 along I-495, 18 along I-270, 1 interchange between I-270 and the I-270 Spurs, and 2 interchanges between I-495 and the I-270 Spurs. The interchange locations are shown in **Figure 2-1**. Lane configurations for I-495 and I-270 are described in **Tables 2-1 and 2-2**, respectively. This list includes the locations of HOV lanes and CD lanes. The locations of the HOV lanes, as well as CD lanes, are shown in **Figure 2-2**.

Figure 2-1: Limits of Traffic Model Network and Interchange Locations Included along I-495 and I-270

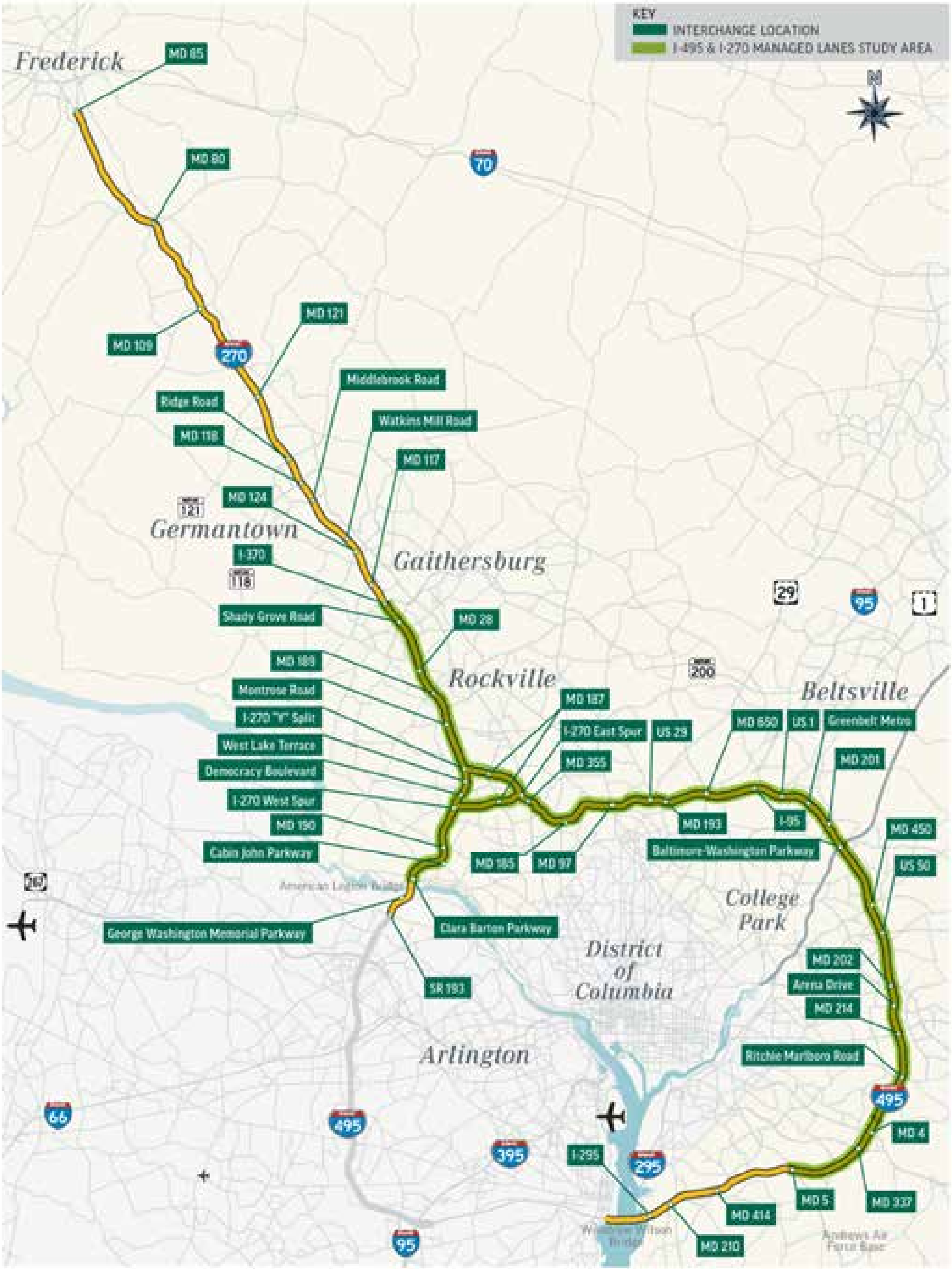


Table 2-1: I-495 Interchanges and Lane Configurations Included in Model

Segment		# Lanes	
From	To	Inner Loop	Outer Loop
VA 193	George Washington Memorial Pkwy	4 + 1 aux	4 + 3 CD
George Washington Memorial Pkwy	Clara Barton Pkwy	4 + 1 aux	4 + 1 aux
Clara Barton Pkwy	Cabin John Pkwy	4	4
Cabin John Pkwy	MD 190	4	4
MD 190	I-270 West Spur	5	5
I-270 West Spur	MD 187	3	3
MD 187	I-270 East Spur/MD 355	3	3
I-270 East Spur/MD 355	MD 185	4	4
MD 185	MD 97	4	4
MD 97	US 29	4	4
US 29	MD 193	4 + 1 aux	4
MD 193	MD 650	4	4 to 5
MD 650	I-95	4 + 1 aux	5 + 1 aux
I-95	US 1	4 + 2 CD	4 + 2 aux
US 1	Greenbelt Metro	4	4
Greenbelt Metro	MD 201	4	4
MD 201	Baltimore-Washington Pkwy	4	4 + 1 aux
Baltimore-Washington Pkwy	MD 450	4	4
MD 450	US 50	4	4 + 1 aux
US 50	MD 202	4 to 3 + 2 CD + 1 aux	4 to 3 + 2 CD + 1 aux
MD 202	Arena Drive	3 + 2 CD + 1 aux	3 + 2 CD + 1 aux
Arena Drive	MD 214	4 + 1 aux	4 + 1 aux
MD 214	Ritchie Marlboro Road	4	4
Ritchie Marlboro Road	MD 4	4	4
MD 4	MD 337	4	4
MD 337	MD 5	4	4
MD 5	MD 414	4	4
MD 414	MD 210	4	4
MD 210	I-295	2 + 3 CD	2 + 3 CD
I-295	Woodrow Wilson Bridge	2 + 3 CD	2 + 3 CD

Table 2-2: I-270 Interchanges and Lane Configurations Included in Model

Segment		# Lanes	
From	**To**	**Southbound**	**Northbound**
North of Split			
MD 85	MD 80	2	2
MD 80	MD 109	2	2
MD 109	MD 121	2	2
MD 121	Father Hurley Boulevard	3	2 + 1 HOV*
Father Hurley Boulevard	MD 118	3 + 1 aux	2 + 1 HOV* + 1 aux
MD 118	Middlebrook Road	3	3 + 1 HOV*
Middlebrook Road	Watkins Mill Road (Future)	4	3 + 1 HOV*
Watkins Mill Road (Future)	MD 124	4	3 + 1 HOV*
MD 124	MD 117	4	3 + 1 HOV* + 2 CD
MD 117	I-370	5 to 4 + 2 CD	3 + 1 HOV* + 3 CD
I-370	Shady Grove Road	3 + 1 HOV* + 3 CD	3 + 1 HOV* + 3 CD
Shady Grove Road	MD 28	3 + 1 HOV* + 2 CD	3 + 1 HOV* + 3 CD
MD 28	MD 189	3 + 1 HOV* + 2 CD	3 + 1 HOV* + 2 CD
MD 189	Montrose Road	3 + 1 HOV* + 2 CD	3 + 1 HOV* + 2 CD
Montrose Road	I-270 Split	5 + 1 HOV*	5 + 1 HOV*
East Spur			
I-270 Split	MD 187	3 to 2 + 1 HOV*	3 to 2 + 1 HOV*
MD 187	I-495	2 + 1 HOV*	2 + 1 HOV*
West Spur			
I-270 Split	Westlake Terrace	2 + 1 HOV*	2 + 1 HOV*
Westlake Terrace	Democracy Boulevard	2 + 1 HOV*	2 + 1 HOV*
Democracy Boulevard	I-495	3	3

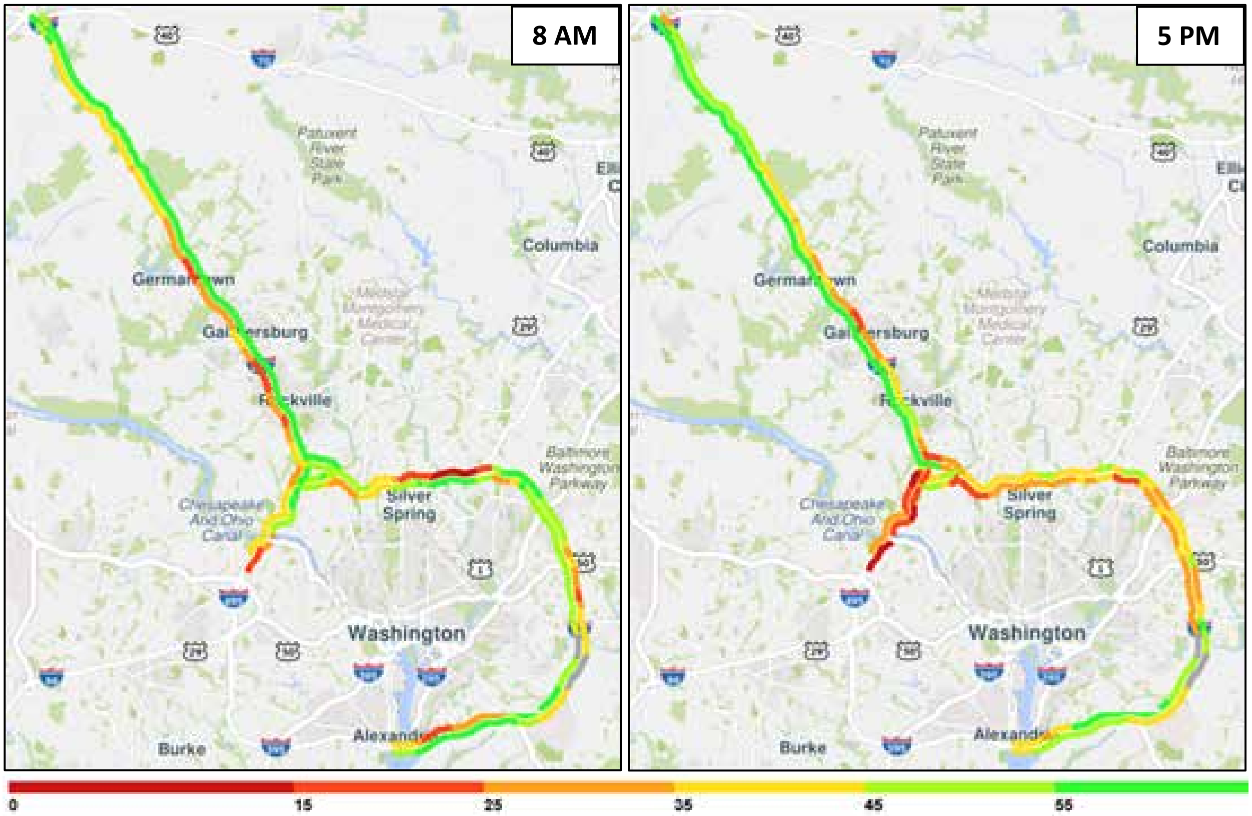
**HOV lanes are in service from 6:00-9:00 AM Southbound and 3:30-6:30 PM Northbound on weekdays; lanes are for general purpose during other times*

Figure 2-2: Locations of High Occupancy Vehicle (HOV) and Collector-Distributor (CD) Lanes

Average speeds in May 2017 along the I-495 and I-270 corridors during the peak morning and early evening hours are shown in **Figure 2-3**. The modeling limits of the I-495 corridor were determined based on congestion identified on the I-495 Outer Loop during the evening peak hour, which bottlenecks at the VA 193 interchange and then impacts the capacities at the American Legion Bridge (ALB), as shown in **Figure 2-3**. It was therefore required to include VA 193 to ensure any proposed managed lane solution did not result in further bottlenecks outside the NEPA limits that might affect the benefits to the driving public. A western terminus approximately 0.4 miles south of the I-495/George Washington Parkway interchange was identified as a logical model terminus as it allows any outer loop mainline improvements that are carried to the George Washington Memorial Parkway to be merged and transitioned into the existing mainline lanes without causing congestion due to lane drops and merges. The tie-in of the proposed improvements with the existing I-495 configuration south of the George Washington Memorial Parkway interchange would not preclude any future improvements completed by Virginia Department of Transportation (VDOT) along I-495, including extending the I-495 HOT lane system to the George Washington Memorial Parkway interchange.

The modeling limits of the I-270 corridor were extended to I-70 to evaluate the traffic congestion impacts of any managed lanes occurring within the NEPA study limits (I-370 to I-495) and how they impact conditions farther north to Frederick. Extending the traffic analysis to I-70 also benefits future traffic analyses for NEPA within the section of I-270 from I-370 to I-70 by ensuring consistency between studies.

Figure 2-3: Average Speeds (mph) for Tuesdays, Wednesdays, and Thursdays in May 2017



Source: Regional Integrated Transportation Information System (RITIS); RITIS did not have speed data along I-495 Inner Loop from MD 214 to Ritchie Marlboro Road or along I-495 Outer Loop from MD 4 to Ritchie Marlboro Road (indicated in gray)

2.2 Analysis Years and Background Projects

For the purposes of this report, the baseline conditions for the Study was set to be the existing year (2017) conditions at the onset of the Study. This scenario is referred to as 2017 Existing within this report, and reflects traffic conditions along I-495 and I-270 prior to the completion of many projects that are proposed, under construction, or were recently completed in the area.

A. I-270 Innovative Congestion Management (ICM) Improvements

The I-270 Innovative Congestion Management (ICM) initiative is a Progressive Design-Build project to construct improvements along I-270 between I-70 and I-495, including the East and West Spurs. This project was announced in April 2017 as a series of targeted improvements with the goal of reducing congestion at key locations. Construction of the ICM improvements is ongoing and is expected to be completed in 2022. The project includes fourteen roadway improvements that increase capacity and vehicle throughput and address safety concerns and bottlenecks. The project also includes innovative technologies and techniques, including adaptive ramp metering and active traffic management strategies, including dynamic message signs and dynamic speed limits. Traffic data with the I-270 ICM improvements could not be incorporated into the 2017 existing year because the project improvements were not fully implemented, so no reliable data was available to collect. **Figure 2-4** displays the proposed improvements of the I-270 ICM initiative.

Figure 2-4: I-270 Innovative Congestion Management (ICM) Improvements

B. I-270 Watkins Mill Road Interchange

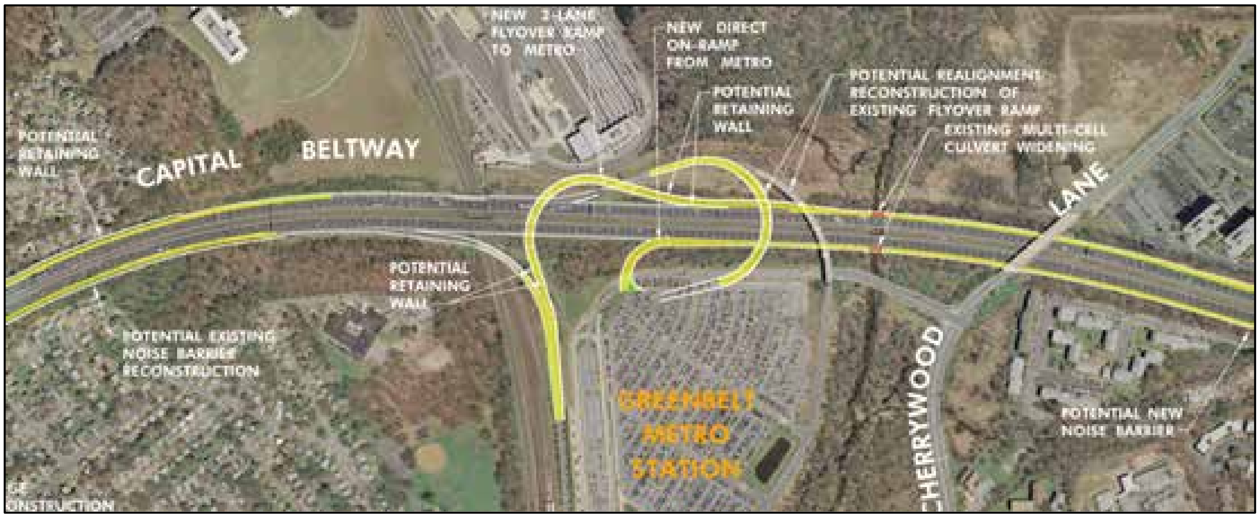
Construction of a new interchange along I-270 at Watkins Mill Road, located north of the interchange at MD 124, was recently completed. The project was opened to traffic in June 2020. An aerial image of the completed interchange is shown in **Figure 2-5**.

Figure 2-5: I-270 at Watkins Mill Road Interchange

C. Greenbelt Metro Station Access Improvements

There is an MDOT SHA-proposed access improvements project at the Greenbelt Metro Station along I-495. These improvements are shown in **Figure 2-6**.

Figure 2-6: Greenbelt Metro Station Access Improvements



D. VDOT I-495 Express Lanes Northern Extension (NEXT) Study

The Virginia Department of Transportation (VDOT) is performing its I-495 Express Lanes Northern Extension (NEXT) study, on a proposed extension of the I-495 Express Lanes from the I-495 at Dulles Toll Road interchange to the American Legion Bridge. The study began in April 2018 and the Environmental Assessment recently received “Findings of No Significant Impact (FONSI)” from FHWA and the National Park Service (NPS). Construction is anticipated to begin in 2022 and be completed by 2025. The study area for this project is shown in **Figure 2-7**.

Figure 2-7: VDOT NEXT Study Area

Source: VDOT

E. MD 97 Montgomery Hills Project

There is an MDOT SHA-proposed project to improve pedestrian and bicycle connectivity and mobility as well as vehicular operations near the interchange of I-495 and MD 97. This project includes the removal of the loop ramp from I-495 Inner Loop to MD 97 Northbound and conversion of this movement to a signalized left-turn movement, and the installation of a traffic signal at the intersection of MD 97 at Flora

Lane south of I-495. This project is currently in the design phase. The plans for this improvement are shown in **Figure 2-8**.

Figure 2-8: MD 97 Montgomery Hills Project

F. MD 185 Salt Barn

In 2020, MDOT SHA completed a project to build a Salt Barn along the ramp from I-495 Outer Loop to MD 185. This project includes a modification of the intersection of MD 185 at I-495 Outer Loop Ramps to create a connection from the off-ramp to the on-ramp through the signal to serve vehicles exiting the Salt Barn. An aerial image of the completed improvements is shown in Figure 2-9.

Figure 2-9: MD 185 Salt Barn

G. Analysis Years

Based on the previous discussion constraints at the time the planning effort was underway, the Study's baseline year was set to 2017 for the Existing Year without the I-270 ICM improvements, the I-270 at Watkins Mill Road interchange, the Greenbelt Metro Access improvements, and VDOT NEXT. These improvements are, however, implemented in all future year analyses, which includes the No Build conditions and Preferred Alternative. For the DEIS, a design year of 2040 was assumed. For subsequent analysis, including the Supplemental DEIS and the FEIS, the design year was updated to be 2045. A 2025 Interim Year was also evaluated for the Air Quality Analysis. The Air Quality Analysis is provided in a separate technical memorandum supporting the EIS (See **FEIS, Appendix K**).

2.3 Measures of Effectiveness

Measures of Effectiveness (MOEs) are the data outputs generated during simulation and analysis that assist in reaching data-driven decisions. For the purposes of the Study, the following MOEs are being reported for comparison between the No Build Alternative and the Preferred Alternative:

- System-wide delay
- Travel Time / Travel Time Index (TTI)
- Average Speed
- Level of Service (LOS)
- Vehicle throughput
- Local network delay

Supplemental operational metrics were also reviewed throughout the Study to help inform decisions and address questions from the public and stakeholders, including:

- Vehicles Miles Traveled (VMT)
- Person throughput
- Latent Demand
- Percent demand met
- Ability to achieve an average speed of 45 mph within the managed lane, while maximizing throughput

Details of the outputs for 2017 Existing Year and 2045 Build Year are described in this report under their respective sections.

2.4 Traffic Analysis Tools

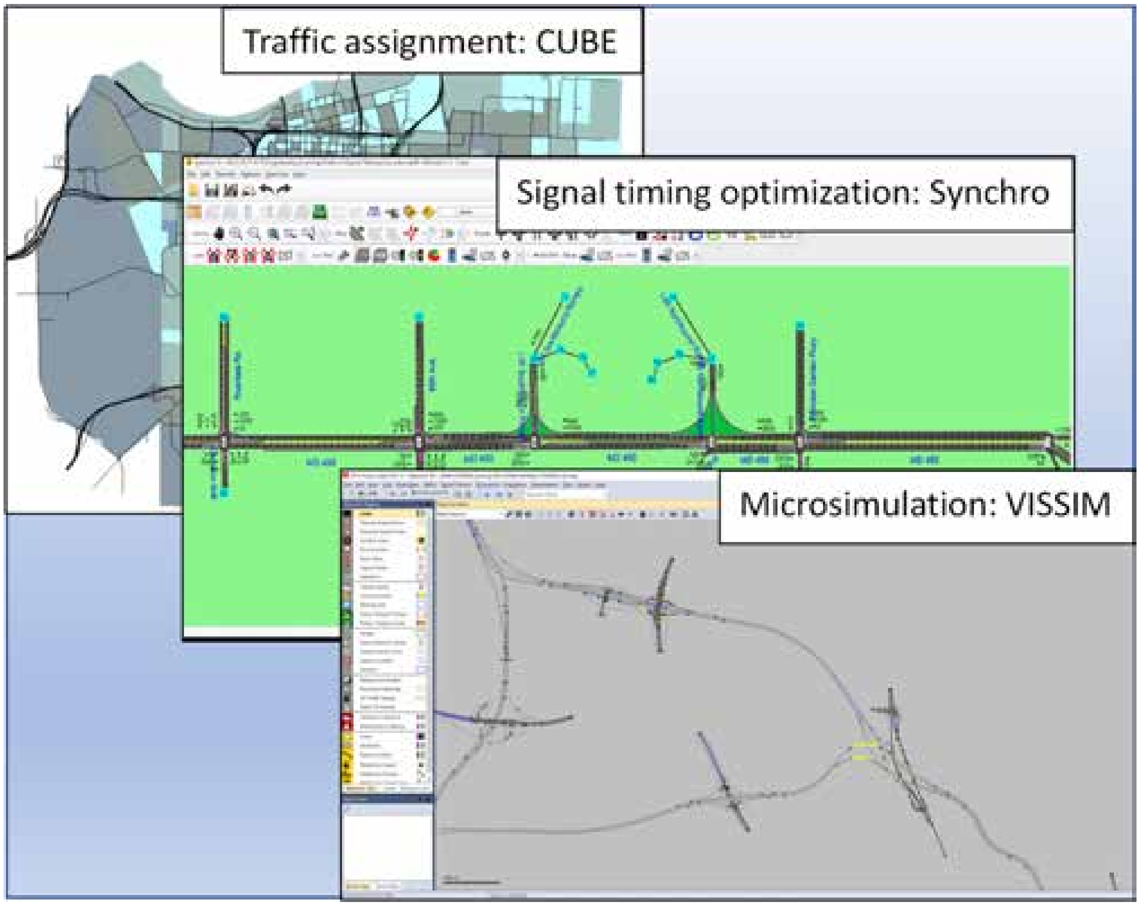
The traffic analysis tools used in this Study include macroscopic and microsimulation modeling software. Examples of these tools are shown in **Figure 2-10**. These tools use industry-standard methods for evaluating travel demand and traffic operations.

- ***CUBE, Version 6,*** by Citilabs, is a macroscopic modeling tool that is used to model regional travel demands based on changes to the transportation network, land use, and population. CUBE was used for this Study to run the travel demand model developed by MWCOG. The travel demand model results are then used to develop traffic volume forecasts.

- ***VISSIM, Version 10.00-09***, by PTV Group, is a traffic microsimulation model with primary applications being arterial and freeway operational analyses. VISSIM allows for flexibility to develop and analyze a wide range of complex vehicle movements and roadway geometry, including managed lanes and alternative interchange designs. VISSIM has the ability to shift unmet demand from one time period to subsequent time periods, which is useful for congested networks with latent demand. Results of VISSIM analyses are evaluated to assess the operations of No Build conditions versus build conditions, in addition to supporting alternatives analysis.

- ***Synchro, Version 10***, by Trafficware, is a deterministic tool primarily used for analyzing traffic flow, traffic signal progression, and traffic signal timing optimization. Synchro is often used to analyze signalized and unsignalized intersections, but not freeways, interchanges, or ramps. Synchro uses Highway Capacity Manual (HCM) and Intersection Capacity Utilization (ICU) methodology to determine intersection capacity and LOS. For this Study, it was used as the basis of signal timing inputs for the VISSIM models.

Figure 2-10: Cube, Synchro, and VISSIM Models

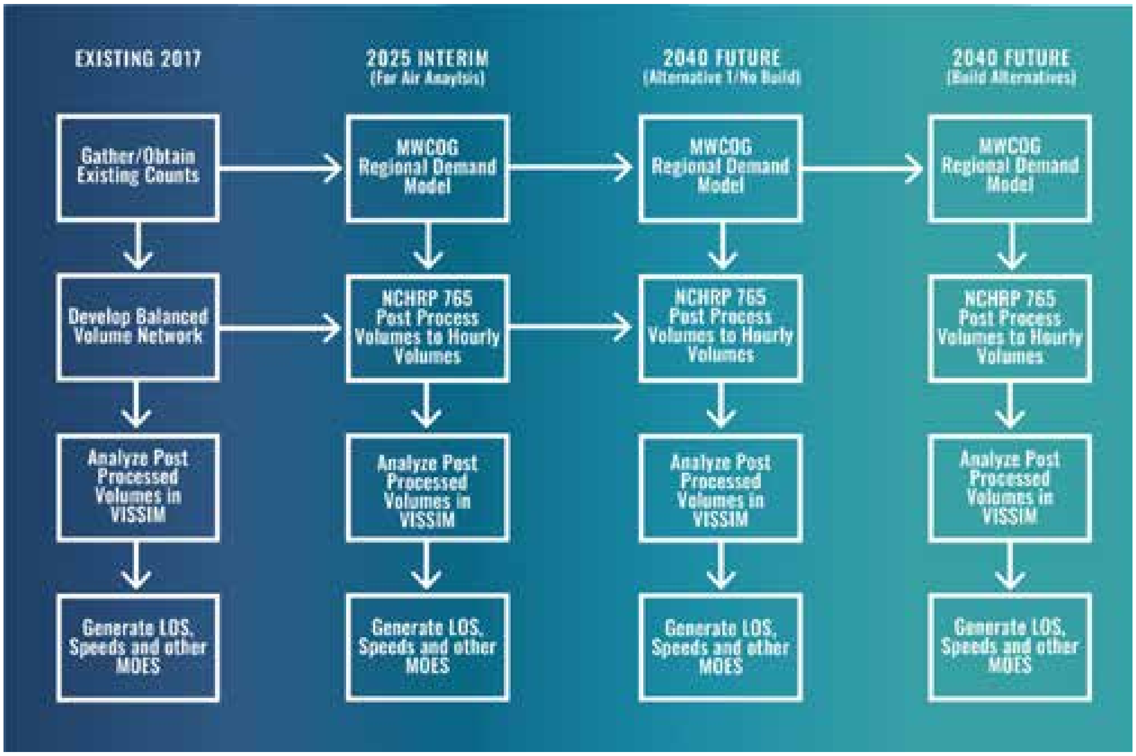


2.5 Overview of Modeling Methodology

The modeling methodology used in this analysis is described below and shown in **Figure 2-11**. Future daily and peak period demand volumes were developed using the Metropolitan Washington Council of Governments (MWCOG) Regional Travel Demand Model, described in Section 4.3 of this report. These volumes were then post-processed into hourly volumes using the methodology outlined in *NCHRP 765:*

Analytical Travel Forecasting Approaches for Project-Level Planning and Design.[2] The post-processed hourly volumes were then entered into VISSIM models, with the use of Synchro software to analyze and develop signal timings. Once the VISSIM models were run, VISSIM generated outputs, including Highway Capacity Manual (HCM) Level of Service (LOS) methodology, speeds, and other measures of effectiveness (MOEs). This process was followed for Existing 2017 conditions, 2025 Interim conditions (for Air Analysis only) and Future No Build conditions. Once the Future No Build model was completed, models of the other build alternatives, including the Preferred Alternative, could be developed. Each step of this process is explained in greater detail later in this report.

Figure 2-11: Modeling Methodology



2.6 Data Collection

In support of the Study, a data collection effort and subsequent data review was completed during the first few months of 2018. In addition to raw data collection, the project team conducted several field observations of the corridor during peak periods on weekdays and used innovative probe speed and origin-destination tools to better observe the corridor's congestion patterns. A summary of the data collection effort is discussed in the following sections.

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[2] National Cooperation Highway Research Program (NCHRP) 765 (2014) is the result of research sponsored by the American Association of State Highway and Transportation officials in cooperation with the Federal Highway Administration. The research was administered by the Transportation Research Board of the National Academies.

2.7 Traffic Counts

Traffic count data was obtained from MDOT SHA's Internet Traffic Monitoring System (I-TMS), which is available to the public[3]. This data includes 59 counts from 2015, 97 counts from 2016, and 102 counts from 2017. Intersection turning movement counts (TMC) and average daily traffic (ADT) counts were collected at 101 locations along the I-495 and I-270 corridors in 2018 to supplement existing traffic data. TMC data was collected using 24-hour video counts and ADT count data was collected over 48-hour periods at mainline and ramp locations. All counts were conducted during typical weekday conditions (Tuesdays, Wednesdays, and Thursdays while schools are in session).

The use of multiple years of data was necessary to meet schedule requirements due to the vast quantity of data needed throughout the entire Study area (over 350 locations). Volume data along I-270 had previously been normalized as part of the I-270 ICM initiative; therefore, most of the new count data was used to supplement the information that had been collected previously.

Volumes were balanced through the study network, including I-495 and I-270 along with the crossing roadways, so that no volume sinks were present along the access-controlled facilities. Along I-270, volumes were developed separately for the local, express, and HOV lanes where multiple facility types exist. For all roadways, ADT and peak period volumes were developed by direction.

Peak period hourly volumes were adjusted upward at some locations where drops in peak period traffic counts were due to upstream congestion and bottlenecks. This produces a set of peak period traffic volumes that reflect the actual traveler demand and not the resulting network throughput, which was needed to ensure that VISSIM model volume inputs for existing (and future) conditions were adequate to represent actual congestion.

Figures 2-12 through 2-17 show the balanced ADTs and peak period volumes along I-495 and I-270. Balanced traffic volumes are included in **Appendix A**.

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[3] http://maps.roads.maryland.gov/itms_public/

Figure 2-12: I-495 Existing (2017) ADTs

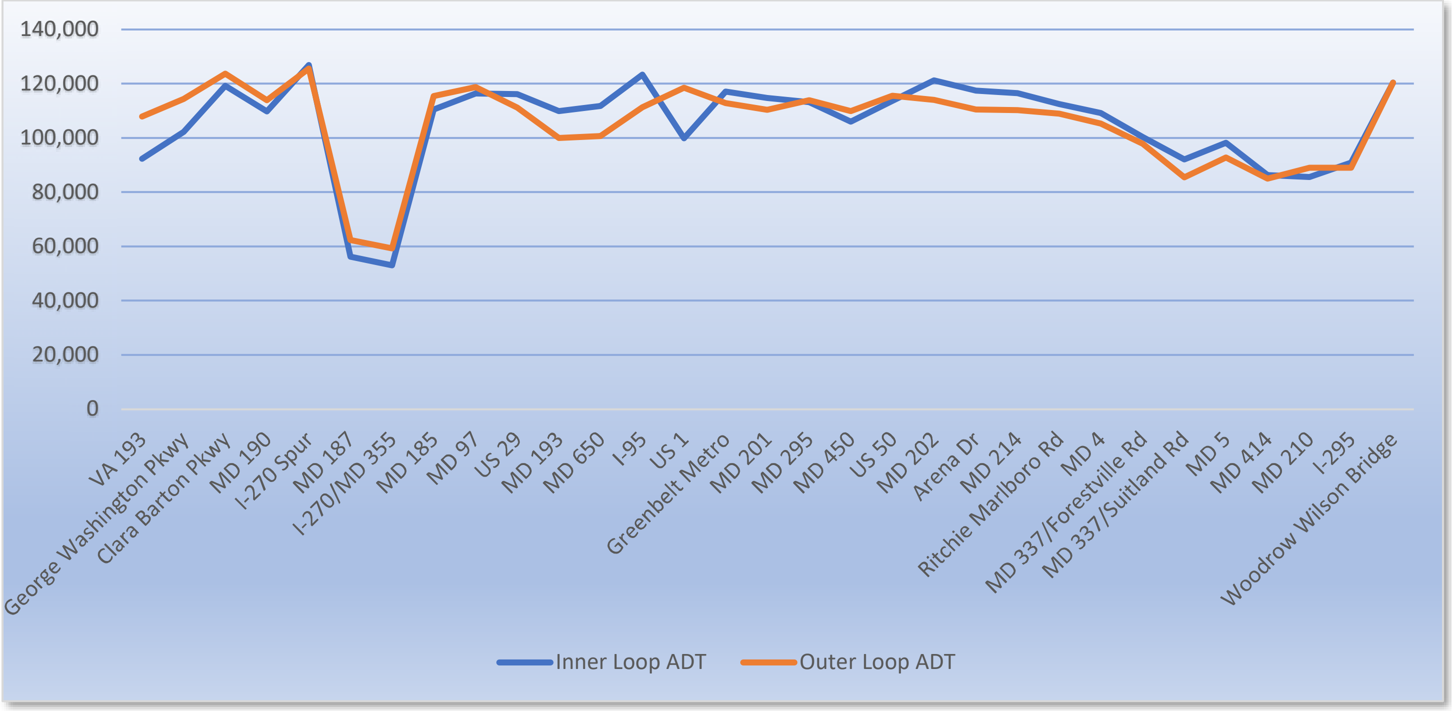


Figure 2-13: I-270 Existing (2017) ADTs

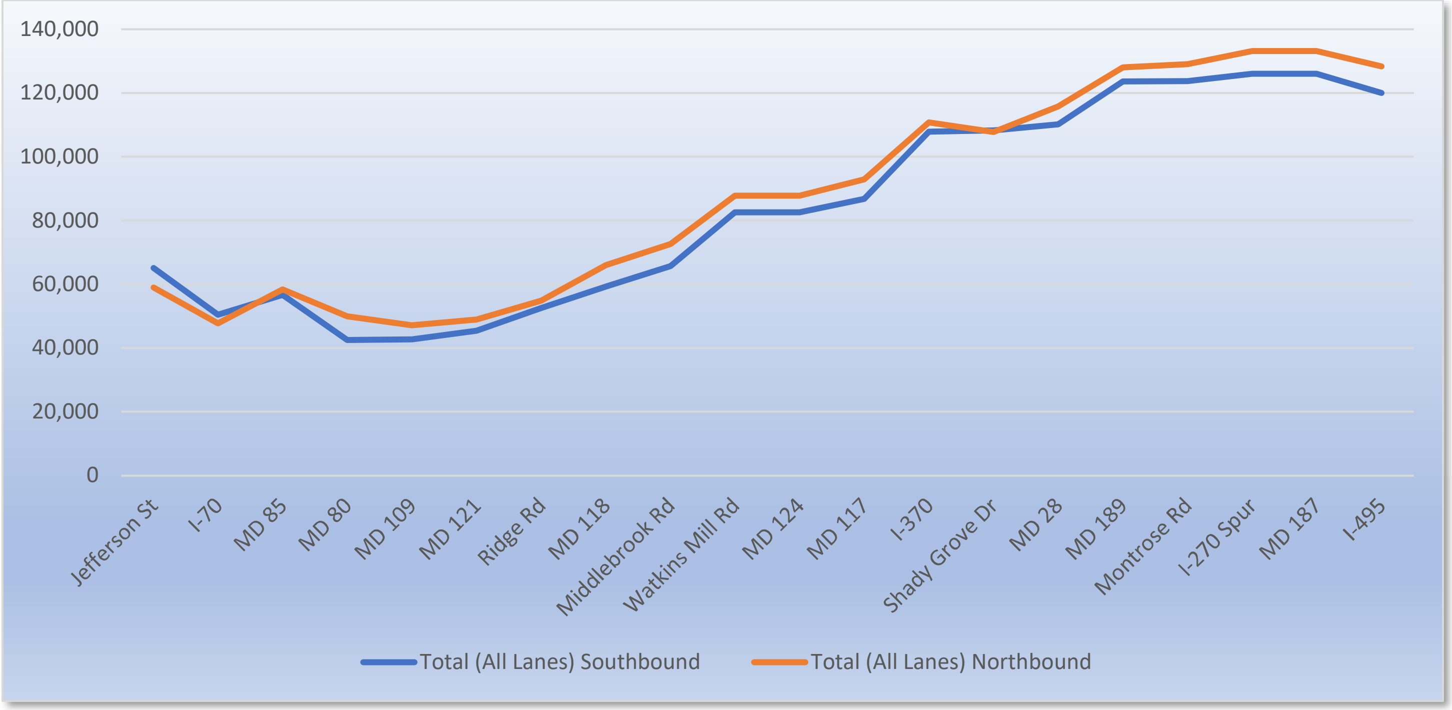


Figure 2-14: I-495 Existing (2017) Inner Loop Peak Period Hourly Volumes

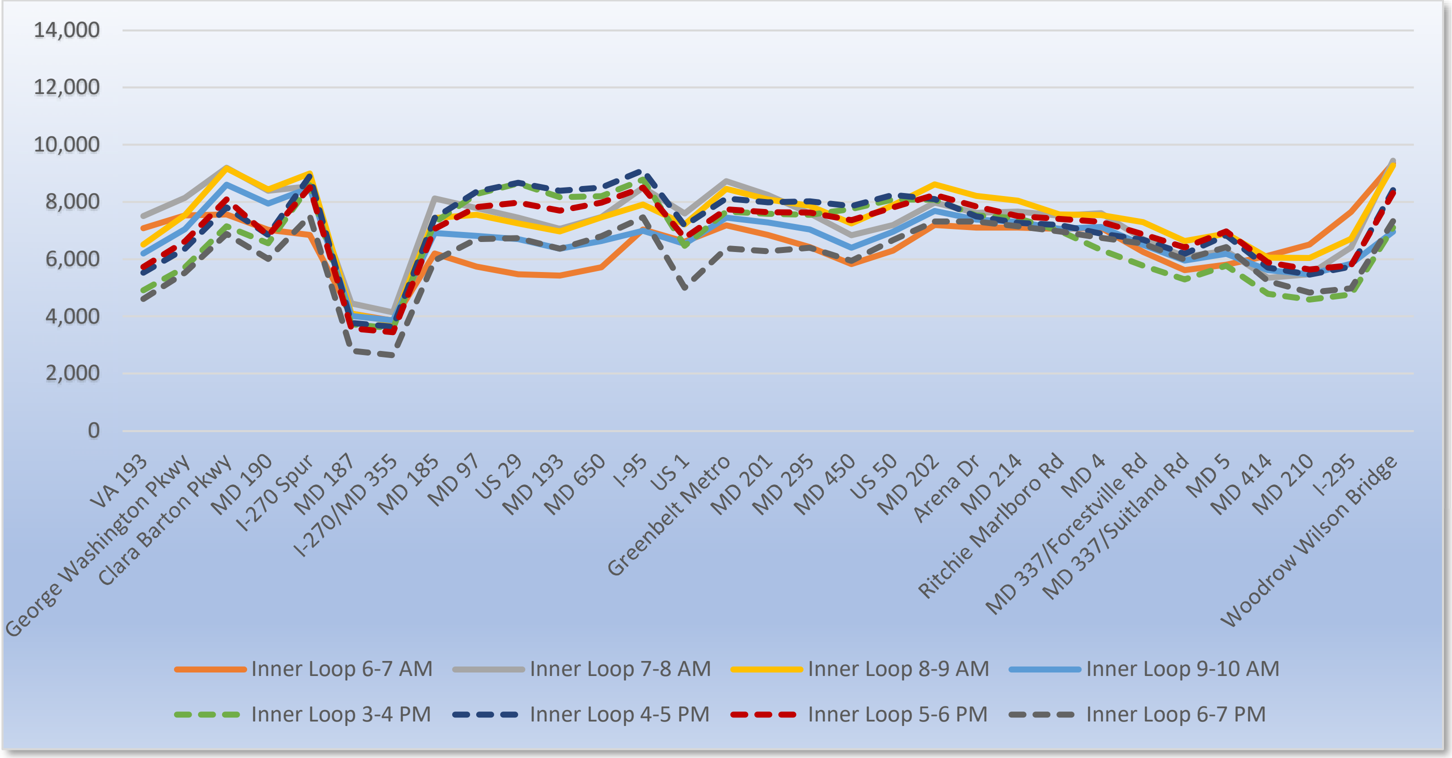


Figure 2-15: I-495 Existing (2017) Outer Loop Peak Period Hourly Volumes

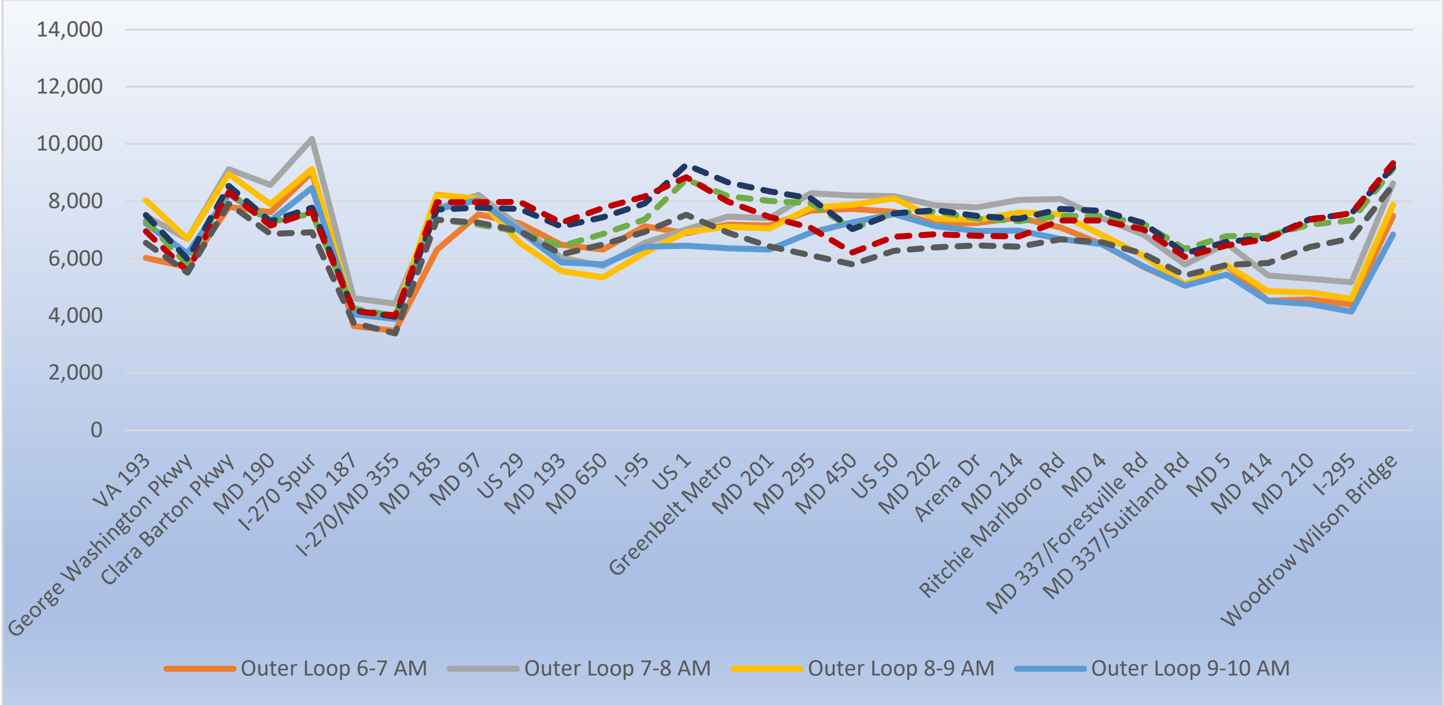
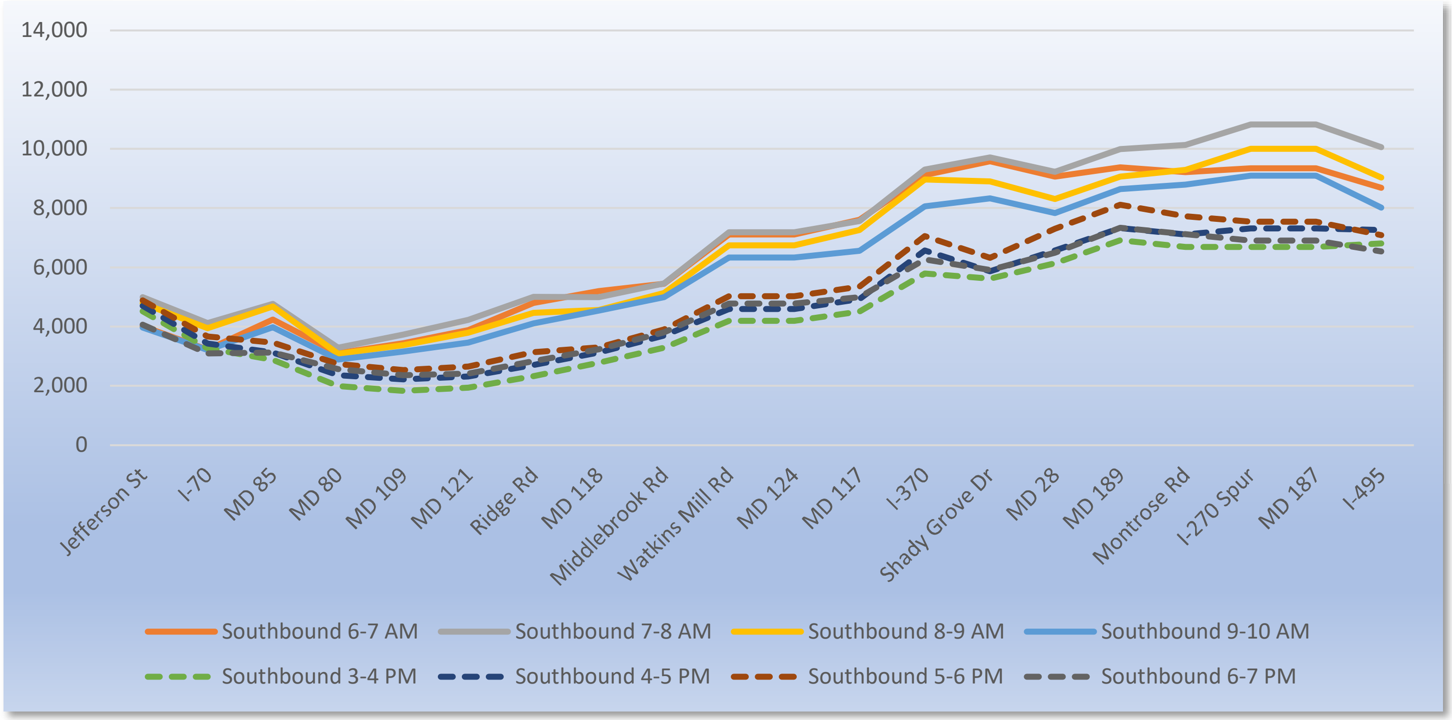
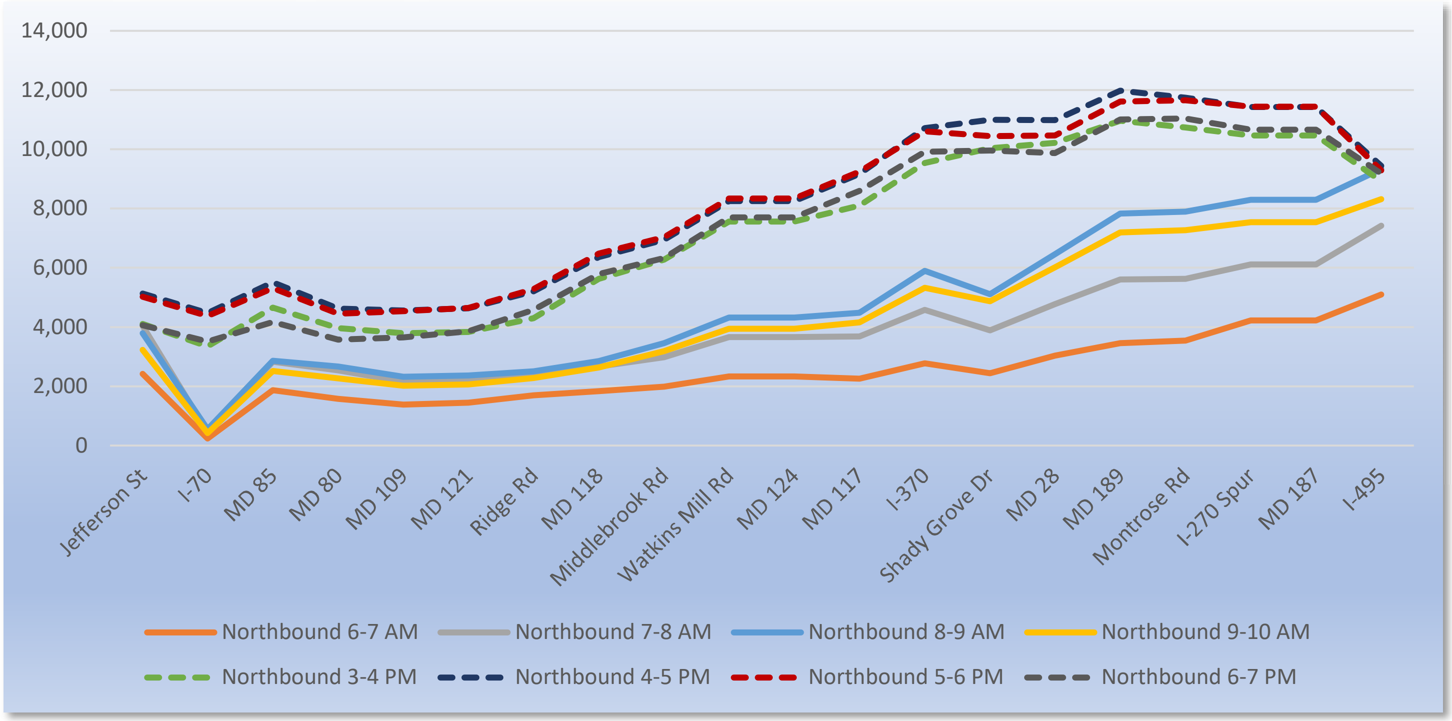


Figure 2-16: I-270 Existing (2017) Southbound Peak Period Hourly Volumes



Note: West Spur and East Spur volumes are combined in this chart

Figure 2-17: I-270 Existing (2017) Northbound Peak Period Hourly Volumes



Note: West Spur and East Spur volumes are combined in this chart

2.8 Speed Data

Hourly speed data along the I-495 and I-270 corridors consists of probe data from the Regional Integrated Transportation Information System (RITIS) platform developed by the University of Maryland's Center for Advanced Transportation Technology (CATT) lab. The RITIS platform provides probe data from INRIX, HERE, TomTom, and NPMRDS for any state-owned facility in Maryland in support of the I-95 Corridor Coalition. The segment-level data is available for any day of the year and any time of the day and provides insight into corridor speeds and bottlenecks. The data for this Study was pulled for all months in 2015 (the oldest count used in this Study) through all months in 2017. **Figures 2-18 through 2-21** show the average and 5th/95th percentile speeds along the I-495 and I-270 corridors throughout the day to demonstrate the variability of the corridor's average speeds.

Figures 2-22 through 2-27 describe the speed breakdown along the corridors for each month of the year, including the average for all months during the two worst hours of the day, found to be 8:00 to 9:00 AM and 5:00 to 6:00 PM along I-495, and 7:30 to 8:30 AM and 5:15 to 6:15 PM along I-270. Also highlighted is the month of May 2017, which as previously discussed was used for calibration purposes. The month of May 2017 was chosen as a month that reflects conditions worse than the average speeds experienced along the corridor during any given day. The average speeds from May 2017 along both the I-270 and I-495 corridors fall at or below the annual average speeds for 2015, 2016, and 2017. Thus, this dataset, and therefore the model used in analysis, reflects at least half of the year's speeds along these corridors, as shown in the following figures. The purpose of selecting this month is to use higher-than-average congestion to ensure that solutions proposed along these corridors can mitigate over half of the conditions experienced on this corridor. It is also important to note that annual average speeds across 2015, 2016, and 2017 do not vary significantly from each other, supporting the use of traffic counts from these years. While the use of count and speed data collected during the same month, week, or even day would be the most ideal situation for modeling purposes, the project schedule, budget, and the availability of technical resources such as traffic counting equipment and technicians needed for a large Study area would not make this option feasible at this time. Note that RITIS did not have speed data along the I-495 Inner Loop from MD 214 to Ritchie Marlboro Road or along the I-495 Outer Loop from MD 4 to Ritchie Marlboro Road. These gaps are noted in the figures.

Figure 2-18: Annual and May 2017 Average and 5th/95th Percentile Speeds for I-495 Inner Loop

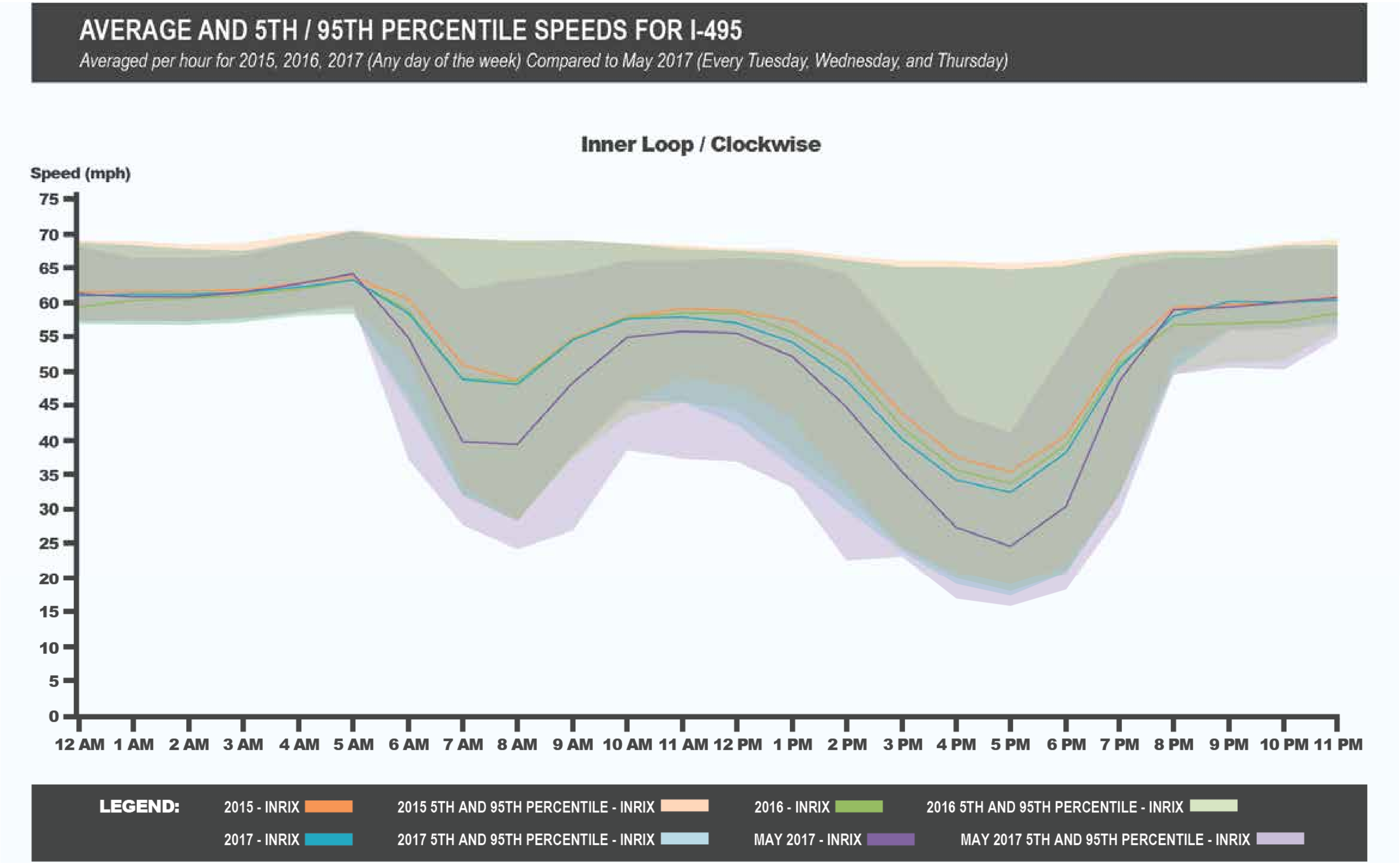


Figure 2-19: Annual and May 2017 Average and 5th/95th Percentile Speeds for I-495 Outer Loop

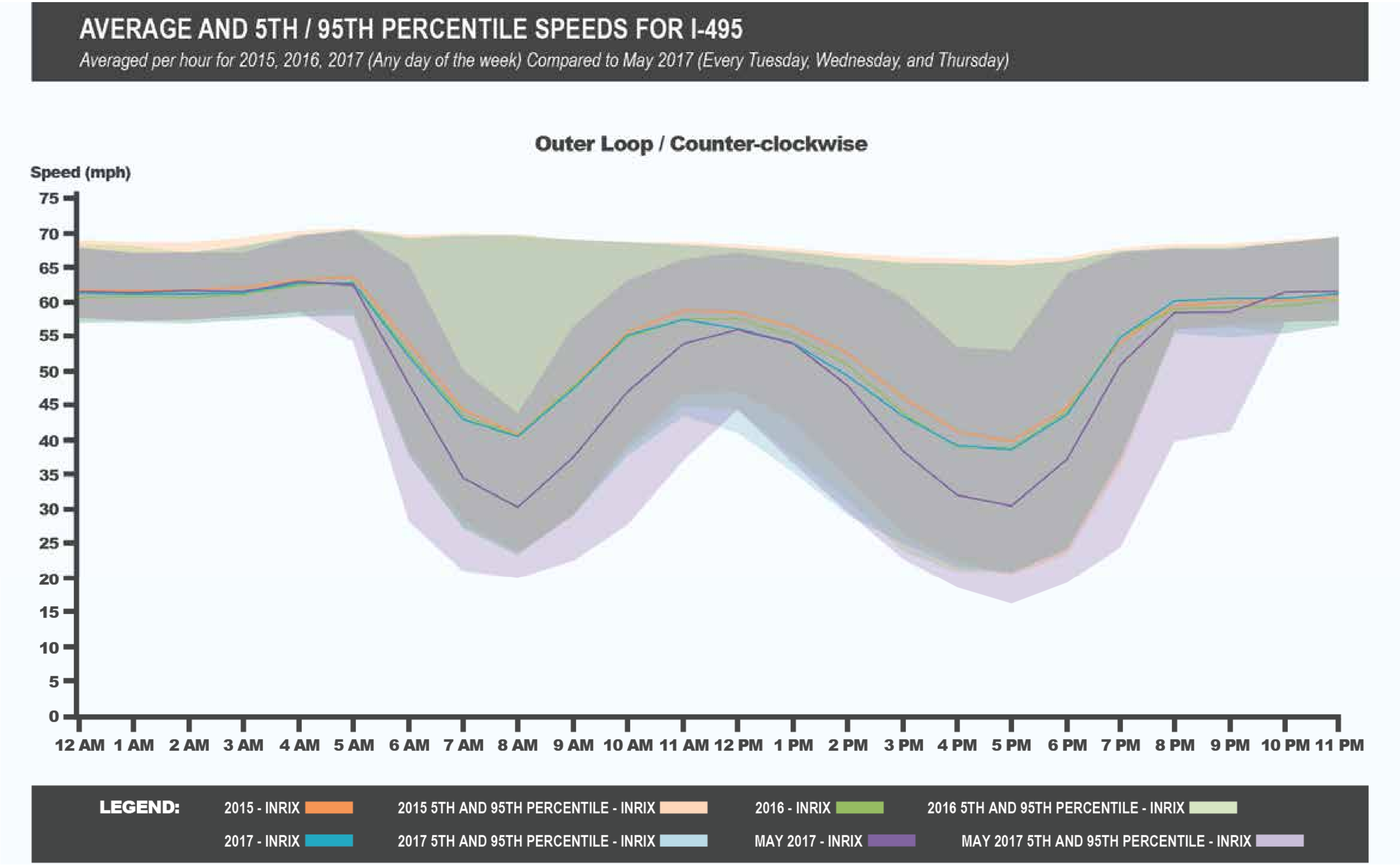


Figure 2-20: Annual and May 2017 Average and 5th/95th Percentile Speeds for I-270 Southbound

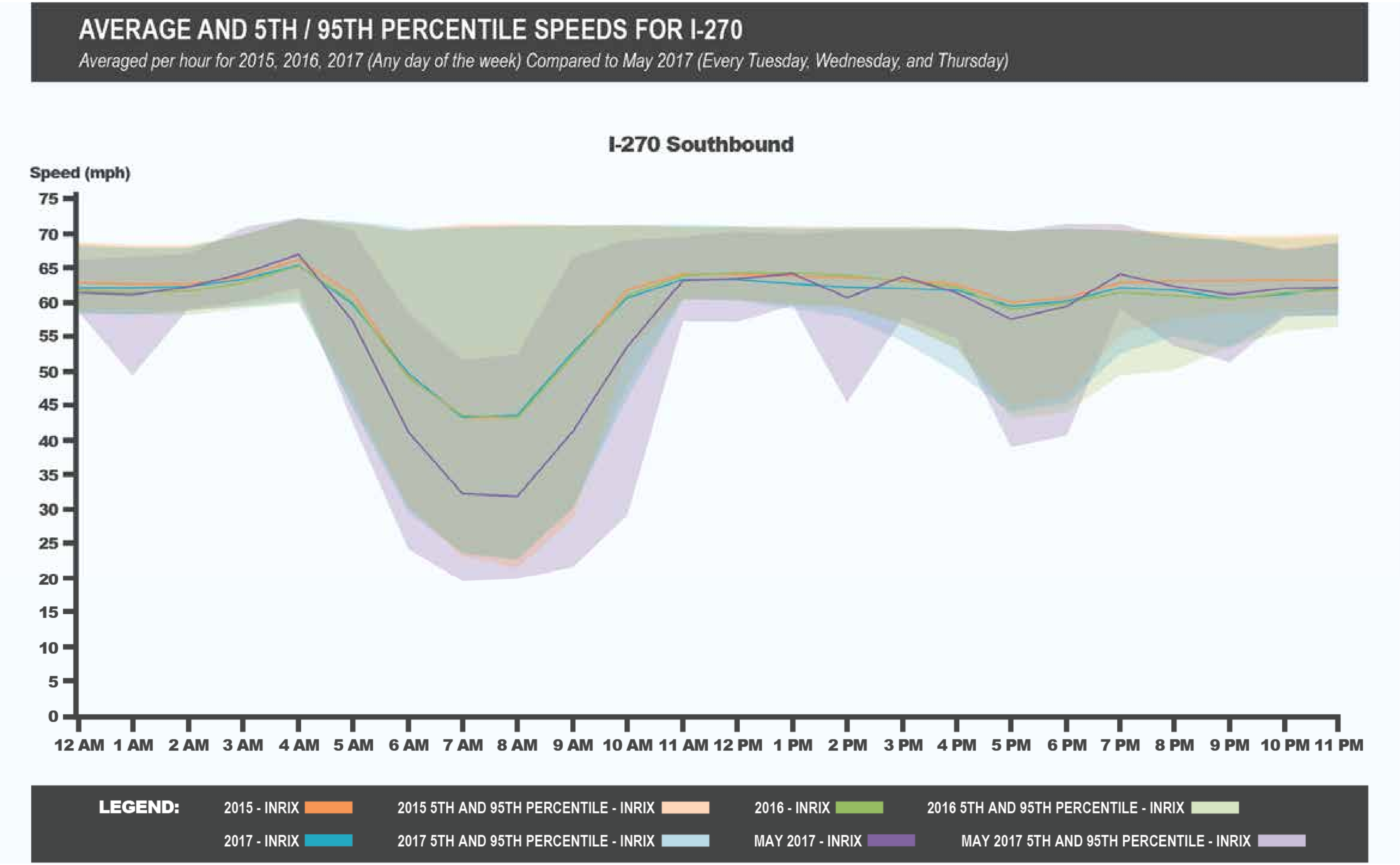


Figure 2-21: Annual and May 2017 Average and 5th/95th Percentile Speeds for I-270 Northbound

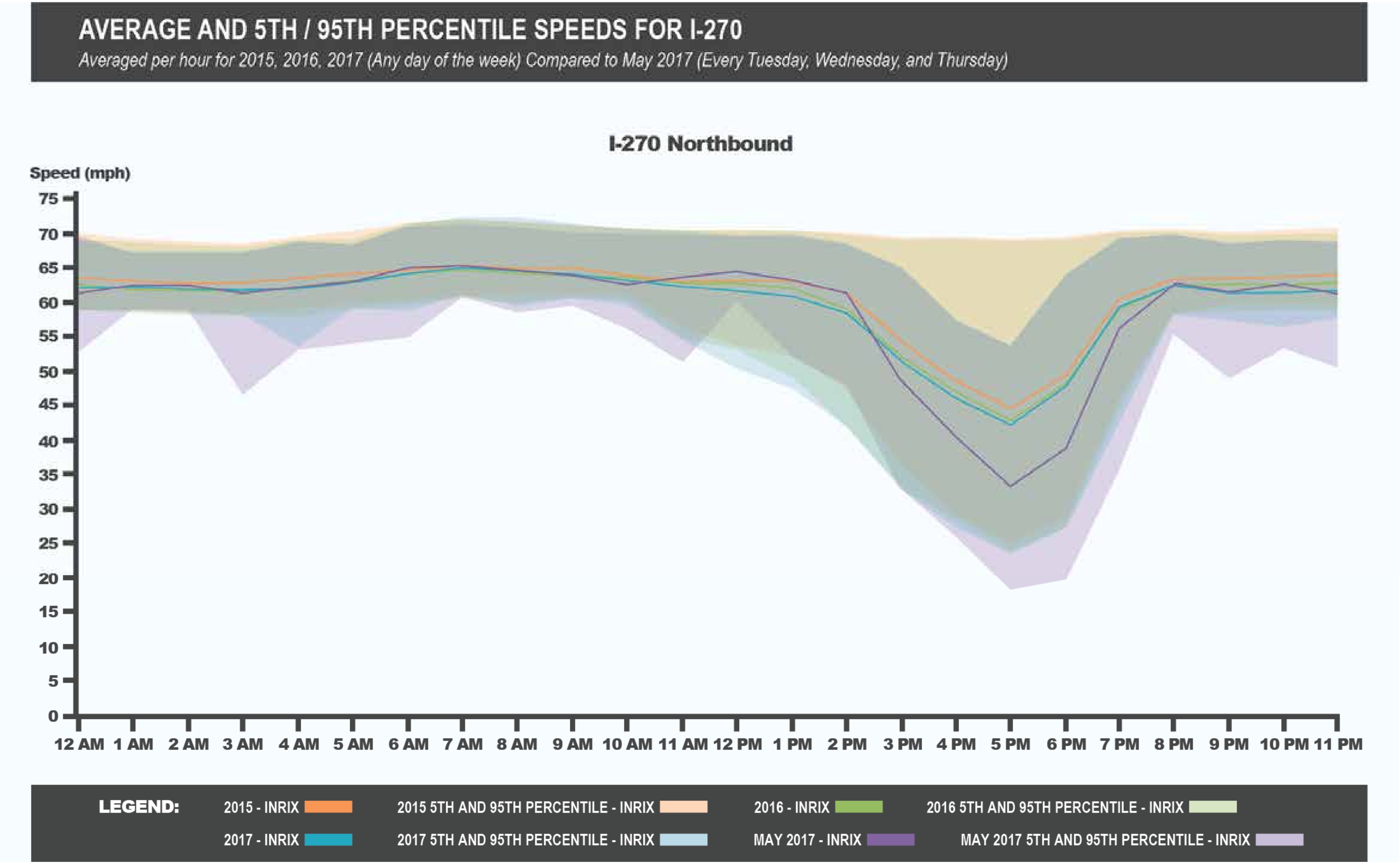


Figure 2-22: 8-9 AM Peak Hour Monthly Average Speeds along I-495 Corridor in 2017 – Inner Loop

Figure 2-23: 8-9 AM Peak Hour Monthly Average Speeds along I-495 Corridor in 2017 – Outer Loop

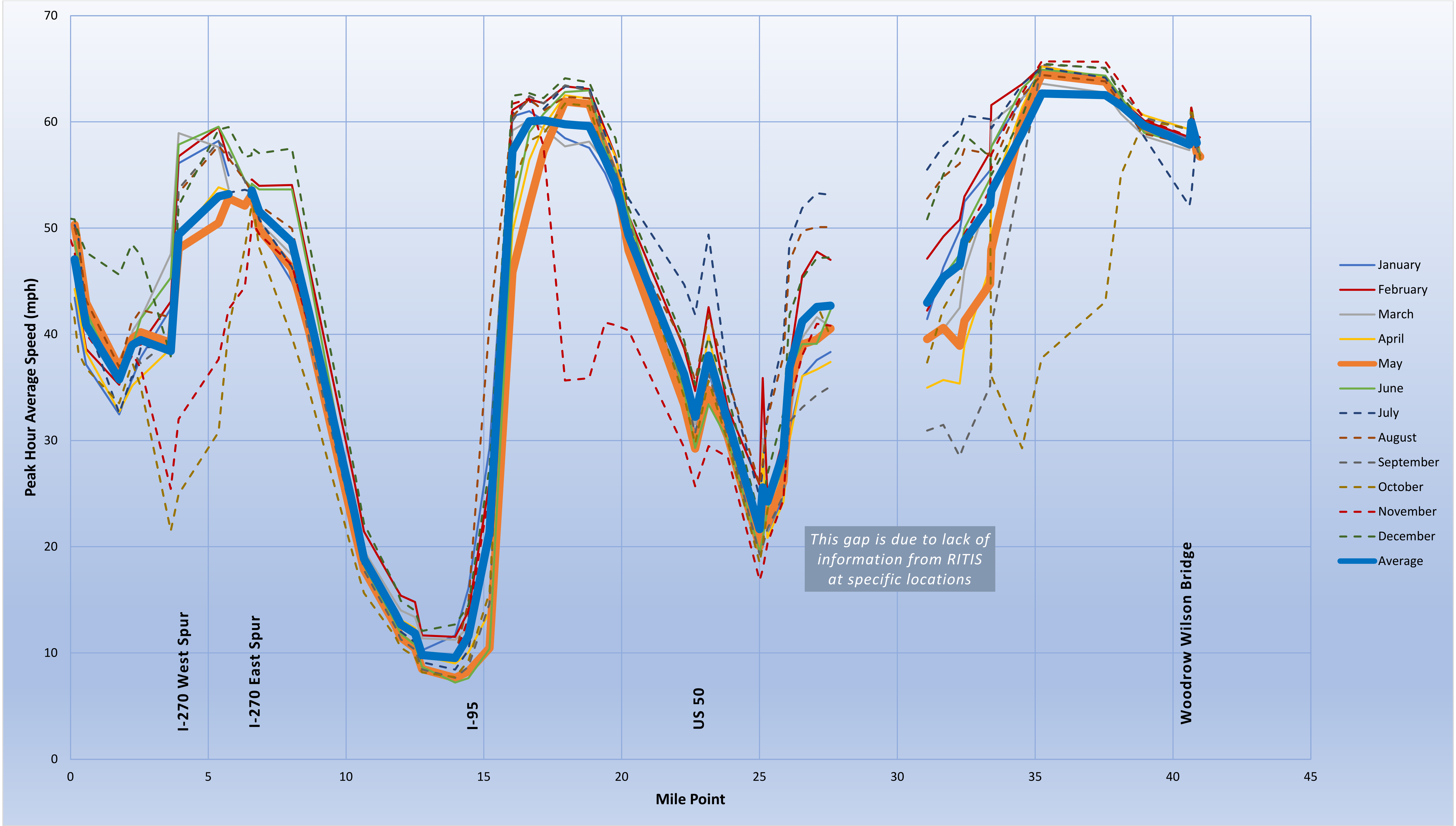


Figure 2-24: 5-6 PM Peak Hour Monthly Average Speeds along I-495 Corridor in 2017 – Inner Loop

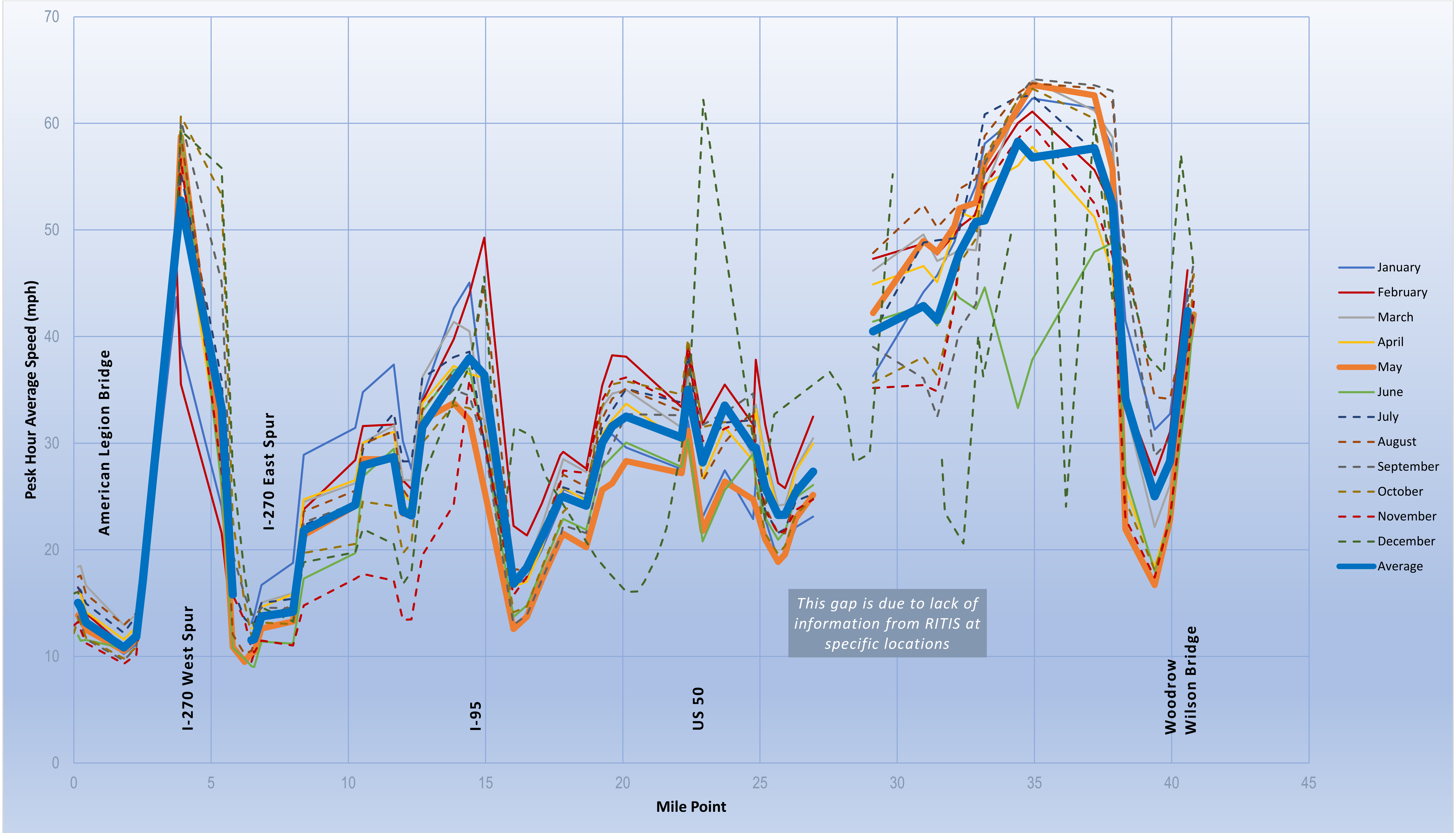
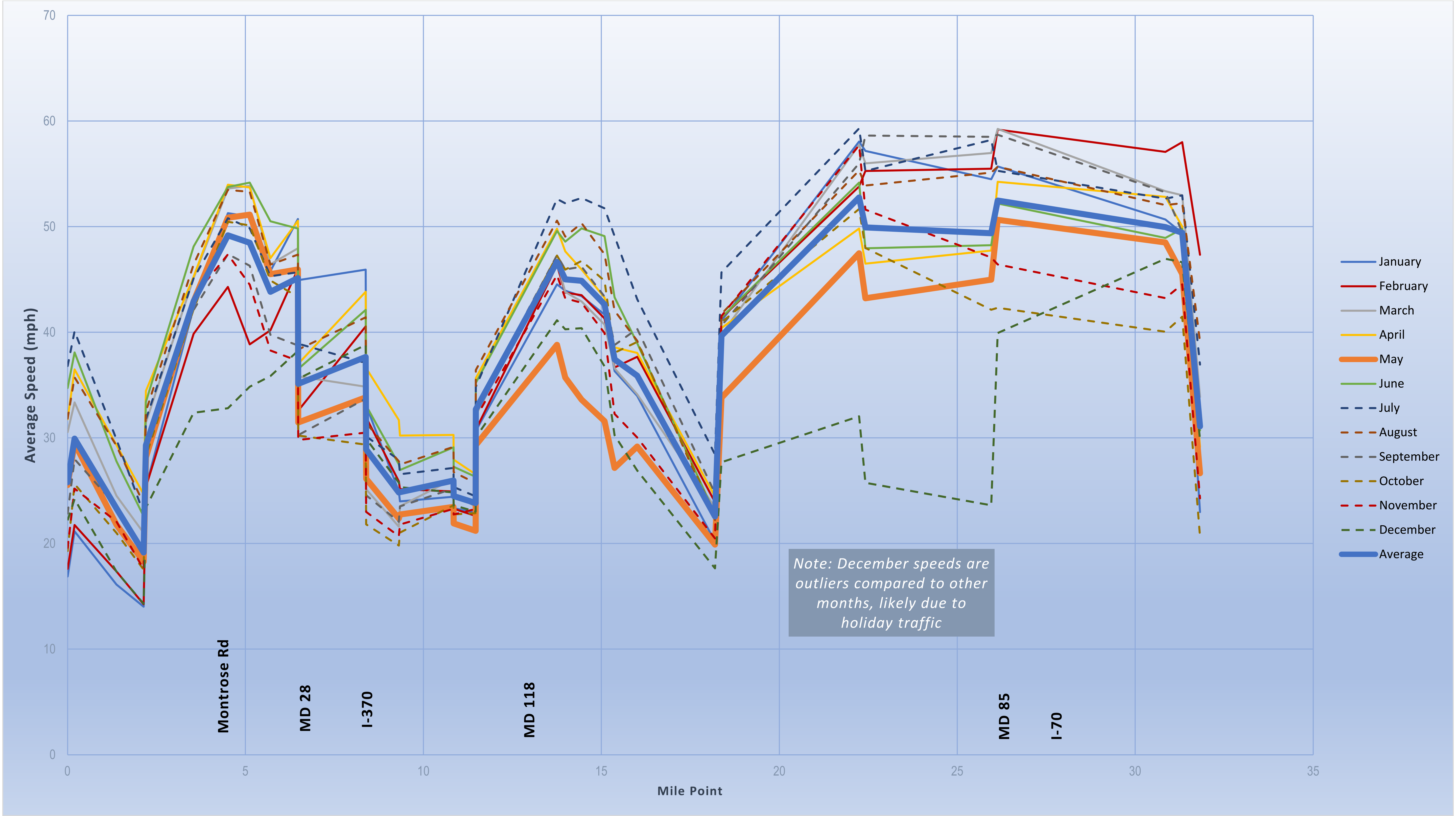


Figure 2-25: 5-6 PM Peak Hour Monthly Average Speeds along I-495 Corridor in 2017 – Outer Loop

Figure 2-26: 7:30-8:30 AM Peak Hour Monthly Average Speeds along I-270 Corridor in 2017 – Southbound

Figure 2-27: 5:30-6:30 PM Peak Hour Monthly Average Speeds along I-270 Corridor in 2017 – Northbound



Note: December speeds are outliers compared to other months, likely due to holiday traffic

2.9 Reliability

As demand from commuter, commercial, and recreational trips increase, operations along these roadway systems degrade, negatively impacting the movement of people and goods throughout the region. MDOT SHA summarizes the congestion trends in its annual *Maryland State Highway Mobility Report*. This report describes performance and mobility trends for the most recent year, compares the results to past years, and identifies accomplishments. Key elements of the *Mobility Report* include Transportation Systems Management and Operations, freight, multi-modalism, and major capital projects. It includes a review of congestion trends. The primary measures of congestion on freeway/expressways are the Travel Time Index (TTI) and the Planning Time Index (PTI). Past trends indicate that the region's rapid growth, combined with its high traffic volume, commuting patterns, and limited capacity, has caused congestion to increase considerably, thus increasing travel and planning times, as indicated in the increased TTI and PTI in recent years. These trends are shown on the following pages.

Key Points

- MDOT SHA uses TTI and PTI to measure the reliability of facilities
- Multiple segments along I-495 and I-270 rank among the top congested segments in Maryland
- The most congested segments during the AM peak include I-495 Outer Loop from the Montgomery/Prince George's County Line to MD 97 and I-495 Inner Loop from MD 210 to I-295
- The most congested segments during the PM peak include I-495 Inner Loop from Clara Barton Parkway to I-270 West Spur and MD 355 to MD 185, I-495 Outer Loop from MD 190 to Cabin John Parkway, I-270 West Spur Southbound from the I-270 Split to Democracy Boulevard, and I-270 Northbound from MD 124 to north of the MD 124 CD Lane

The TTI, which is also used in the MDOT *Excellerator*[4] program as a performance measure metric, compares the 50th percentile travel time of a trip on a segment of freeway/expressway for a particular hour to the travel time of a trip during off-peak conditions when vehicles travel at free-flow or uncongested conditions. The higher the TTI for a given hour of the day, the longer the travel time for that hour compared to free-flow travel time. A TTI of 1.0 indicates free-flow conditions, a TTI of 2.0 indicates a trip takes twice as long as free-flow conditions, and a TTI of greater than 2.0 indicates severe congestion. The TTI for each highway segment is calculated to provide an understanding of the statewide freeway/expressway system for average weekday peak hour conditions.

However, longer travel times only demonstrate part of the congestion issue along the Study corridors. A user can plan accordingly if they know their expected travel time, but when travel times vary greatly, such as within these Study corridors, trip reliability is uncertain. MDOT SHA measures trip reliability using the PTI, which represents the total time travelers should allow to ensure they arrive at their destination on time while considering potential delays due to non-recurring congestion. MDOT SHA uses the ratio of the 95th percentile travel time to the free-flow travel time to derive the PTI. For example, if a section of roadway that takes 5 minutes to traverse in free-flow conditions has a PTI of 3.0, motorists should allow

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[4] MDOT *Excellerator* is a performance management system comprised of ten tangible results. These results are used by MDOT to drive its daily business decisions. It is updated quarterly.

15 minutes to ensure arriving on time. The lower the PTI, the more reliable the trip. The higher the PTI, the less reliable and longer a trip might take.

Additionally, users traveling along roadways that experience high levels of congestion are more likely to be impacted by minor incidents. These incidents can produce severe back-ups and system-level unreliable conditions for hours. Recent trends indicate that congestion continues to negatively impact the region. The 2018 *Mobility Report* lists the top 15 most congested freeway/expressway segments statewide for the AM and PM peaks, and their reliability values, for the years 2016 and 2017. The 2016 *Mobility Report* lists the top 30 most congested freeway/expressway segments statewide for the AM and PM peaks, and their reliability values, for the years 2014 and 2015. Those segments that ranked in the top 15 for 2017 and occurred within the Study corridors are provided below in **Tables 2-3 and 2-4**.

All roadway segments listed and ranked in these tables experienced severe congestion (TTI greater than 2.0) during the peak travel times for 2014 through 2017. All roadway segments listed, and ranked, also experienced high to extreme unreliability (PTI greater than 2.5) during these three years. Segments listed as "Not Ranked" did not experience a TTI or PTI severe enough to be in the rankings for that year. The peak hours in these tables are 8-9 AM and 5-6 PM, as defined by the *Mobility Report*.

Table 2-3: Top Congested Segments in the Study Area and Reliability Values (AM Peak Hour)

Road	Location	Direction	2017 Rank (TTI)	2016 Rank (TTI)	2015 Rank (TTI)	2014 Rank (TTI)	2017 Rank (PTI)	2016 Rank (PTI)	2015 Rank (PTI)	2014 Rank (PTI)
I-495	MD 650 to MD 193	Outer Loop	1 (5.1)	1 (4.8)	1 (4.4)	2 (3.9)	2 (8.3)	2 (8.0)	6 (8.5)	6 (7.5)
I-495	At MD 650	Outer Loop	2 (4.6)	2 (4.5)	2 (4.4)	1 (4.0)	1 (8.9)	1 (8.7)	1 (9.2)	1 (9.0)
I-495	MD 193 to US 29	Outer Loop	3 (4.1)	3 (3.9)	4 (3.6)	4 (3.2)	11 (6.2)	12 (6.2)	15 (6.3)	15 (5.8)
I-495	I-95 to Prince George's County Line	Outer Loop	5 (3.6)	6 (3.5)	15 (2.4)	15 (2.5)	3 (8.2)	3 (8.0)	4 (9.0)	3 (8.6)
I-495	US 29 to MD 97	Outer Loop	9 (2.9)	9 (3.0)	8 (2.8)	7 (2.5)	38 (4.0)	33 (4.2)	48 (4.4)	47 (4.0)
I-495	MD 210 to I-295	Inner Loop	10 (2.9)	14 (2.7)	27 (2.2)	19 (2.1)	8 (6.3)	14 (5.5)	28 (5.2)	28 (4.6)

Source: Maryland State Highway Mobility Report, 2016 and 2018

MDOT SHA defines the various levels of congestion in four categories based on TTI. These are:

- *Uncongested (TTI < 1.15)*
- *Moderate Congestion (1.15 < TTI < 1.3)*
- *Heavy Congestion (1.3 < TTI < 2.0)*
- *Severe Congestion (TTI > 2.0)*

For reporting purposes, MDOT SHA categorizes PTI for freeways/expressways as:

- *Reliable (PTI < 1.5)*
- *Moderately Unreliable (1.5 < PTI < 2.5)*
- *Highly to Extremely Unreliable (PTI > 2.5)*

Top-ranked statewide segment in red

Table 2-4: Top Congested Segments in the Study Area and Reliability Values (PM Peak Hour)

Road	Location	Direction	2017 Rank (TTI)	2016 Rank (TTI)	2015 Rank (TTI)	2014 Rank (TTI)	2017 Rank (PTI)	2016 Rank (PTI)	2015 Rank (PTI)	2014 Rank (PTI)
I-495	At Cabin John Pkwy	Inner Loop	1 (4.5)	3 (4.2)	4 (3.7)	3 (3.6)	5 (7.5)	7 (6.9)	9 (7.4)	9 (7.1)
I-495	Clara Barton Pkwy to Cabin John Pkwy	Inner Loop	6 (3.8)	9 (3.5)	8 (3.2)	7 (3.1)	14 (6.0)	16 (5.8)	17 (6.3)	20 (5.6)
I-270 Spur	I-270 Split to Democracy Blvd	South-bound	7 (3.5)	1 (4.7)	12 (3.0)	74 (1.8)	1 (10.4)	2 (11.6)	1 (15.0)	1 (11.7)
I-495	MD 355 to MD 185	Inner Loop	9 (3.4)	14 (3.0)	25 (2.5)	38 (2.1)	19 (5.7)	25 (5.1)	32 (5.2)	16 (6.0)
I-495	At MD 185	Inner Loop	10 (3.4)	19 (2.9)	26 (2.5)	35 (2.2)	20 (5.6)	28 (5.0)	36 (5.1)	15 (6.0)
I-495	At MD 355	Inner Loop	11 (3.3)	24 (2.7)	Not Ranked	Not Ranked	6 (7.2)	6 (7.1)	Not Ranked	Not Ranked
I-495	MD 190 to I-270 West Spur	Inner Loop	12 (3.3)	13 (3.2)	9 (3.1)	8 (3.1)	43 (4.4)	38 (4.4)	38 (5.1)	26 (5.3)
I-270	MD 124 to North of MD 124 CD Lane	North-bound	13 (3.3)	12 (3.3)	17 (2.8)	21 (2.4)	30 (5.0)	24 (5.1)	39 (5.0)	36 (5.0)
I-495	At MD 190	Outer Loop	14 (3.2)	11 (3.4)	13 (2.9)	62 (1.9)	33 (4.8)	30 (4.9)	19 (6.2)	40 (4.7)
I-495	MD 190 to Clara Barton Pkwy	Outer Loop	15 (3.1)	8 (3.5)	Not ranked	Not ranked	23 (5.4)	17 (5.7)	Not ranked	Not ranked

Source: Maryland State Highway Mobility Report, 2016 and 2018

MDOT SHA defines the various levels of congestion in four categories based on TTI. These are:

- *Uncongested (TTI < 1.15)*
- *Moderate Congestion (1.15 < TTI < 1.3)*
- *Heavy Congestion (1.3 < TTI < 2.0)*
- *Severe Congestion (TTI > 2.0)*

For reporting purposes, MDOT SHA categorizes PTI for freeways/expressways as:

- *Reliable (PTI < 1.5)*
- *Moderately Unreliable (1.5 < PTI < 2.5)*
- *Highly to Extremely Unreliable (PTI > 2.5)*

Top-ranked statewide segment in red

The 2045 TTI projections show even greater impacts, with an increase in travel times of over 20 percent at all locations along I-495 during the AM peak period, and even greater travel time increases of up to 60 percent during the 2045 PM peak period, as shown in **Tables 2-5 and 2-6**. 2045 TTIs were projected for the top congested segments along I-495, I-270, and I-270 Spur.

As travel times along the Study corridors increase, users will need to increase their planned travel time to reach their intended destinations. Additionally, increased amounts of congestion will decrease vehicle spacing along the roadways, thereby increasing the potential for congestion-related crashes, particularly rear end and sideswipe collisions. When these occur, traffic incidents and non-recurring congestion will further degrade the performance and reliability of I-495 and I-270, causing additional delay for the projected 300,000+ commuters each weekday by 2045. All these issues will also contribute to higher travel costs.

Table 2-5: 2017 and 2045 No Build Study Corridors TTI (AM Peak Hour)

Road	Location	Direction	2017 TTI	2045 TTI	Forecasted % Increase
I-495	MD 650 to MD 193	Outer Loop	5.1	6.5	27%
I-495	At MD 650	Outer Loop	4.6	6.0	30%
I-495	MD 193 to US 29	Outer Loop	4.1	5.3	29%
I-495	I-95 to Prince George's County Line	Outer Loop	3.6	7.2	100%
I-495	US 29 to MD 97	Outer Loop	2.9	4.0	38%
I-495	MD 210 to I-295	Inner Loop	2.9	3.6	24%

Table 2-6: 2017 and 2045 No Build Study Corridors TTI (PM Peak Hour)

Road	Location	Direction	2017 TTI	2045 TTI	Forecasted % Increase
I-495	At Cabin John Pkwy	Inner Loop	4.5	6.1	36%
I-495	Clara Barton Pkwy to Cabin John Pkwy	Inner Loop	3.8	4.9	29%
I-270 Spur	I-270 Split to Democracy Blvd	Southbound	3.5	3.5	0%
I-495	MD 355 to MD 185	Inner Loop	3.4	3.7	9%
I-495	At MD 185	Inner Loop	3.4	4.7	38%
I-495	At MD 355	Inner Loop	3.3	5.3	61%
I-495	MD 190 to I-270 West Spur	Inner Loop	3.3	5.1	55%
I-270	MD 124 to North of MD 124 CD Lane	Northbound	3.3	4.0	21%
I-495	At MD 190	Outer Loop	3.2	3.4	6%
I-495	MD 190 to Clara Barton Pkwy	Outer Loop	3.1	3.1	0%

Source: MDOT SHA Mobility Report, 2018

MDOT SHA defines the various levels of congestion in four categories based on TTI. These are:

- *Uncongested (TTI < 1.15)*
- *Moderate Congestion (1.15 < TTI < 1.3)*
- *Heavy Congestion (1.3 < TTI < 2.0)*
- *Severe Congestion (TTI > 2.0)*

Overall, the TTI and PTI data show that users in the corridor need an option for a reliable trip when the general-purpose lanes experience recurring or non-recurring congestion. Users would benefit from having an option with a more reliable travel time for their trips, one that would reliably operate at an acceptable level of service even when the general-purpose lanes are congested. Such an option would provide users with a way to reach their destinations with a predictable travel time.

2.10 Signal Timing

Signal controller timing data for all signalized ramp terminals along the I-495 and I-270 interchanges were provided by the relevant agencies. Signals along state routes are owned by MDOT SHA for traffic signals in Prince George's County and Frederick County and by Montgomery County Department of

Transportation (MCDOT), for traffic signals in Montgomery County. Signal timings for County-owned signals were provided by the relevant county. The latest timings were requested to ensure the timings in the model were reflective of the latest timing updates.

2.11 Regional Travel Demand Model Calibration: MWCOG

A. Definition of the MWCOG Model

The National Capital Region Transportation Planning Board (TPB) is the federally-designated metropolitan planning organization (MPO) serving the metropolitan Washington, DC area. The TPB is located at the Metropolitan Washington Council of Governments (MWCOG) and develops the regional travel demand model for the Washington, DC region. The regional travel demand model for the Washington, DC region is the MWCOG Travel Demand Forecasting Model. This model extends across 22 jurisdictions in the District of Columbia, Maryland, Virginia, and West Virginia, including the study area for the I-495 and I-270 Managed Lane Study. The model includes all major roadways and public transportation services (including bus, Metrorail, and commuter rail), local land use data, and population, household, and employment data. Land uses in the area are shown in **Figure 2-28**.

For the SDEIS and the FEIS, MDOT SHA used an updated version of the MWCOG model, Version 2.3.75, which was released in Fall 2018. Previously, the DEIS used an earlier version of the MWCOG model, Version 2.3.71 (November 2017), because it was the most recently adopted model at the time the modeling for the MLS was initiated. There are three primary differences between the model versions. First, land use data was updated as part of MWCOG's regularly updated population, household, and employment cooperative forecasts from Round 9.0 to Round 9.1. Second, the transportation network was updated with new projects per the latest Constrained Long-Range Plan (CLRP), approved in 2018. Finally, forecasts were performed at five-year intervals out to the year 2045, which allowed MDOT SHA to extend the design year to 2045 for analysis in the SDEIS and FEIS.

B. MWCOG Modeling Methodology

To provide consistency with regional planning efforts, the MWCOG Travel Demand Forecasting Model, Version 2.3.75 was used as the basis for the development of daily and peak period traffic forecasts. The MWCOG model is a mathematical representation of the supply and demand for travel in an urban area. The travel supply is generally represented by a highway network and a transit network. The highway network represents all major roads in the region, including managed lane facilities, and the transit network represents all public transportation service in the region, including bus, Metrorail, and commuter rail. In addition to transportation networks, the other major input to the travel model is the land activity data for each transportation analysis zone (TAZ). The demand for travel is developed using a series of mathematical models. Models exist for the following years: 2015, 2017, 2020, 2025, 2030, 2040, and 2045. The forecasting methodology was consistent with FHWA's *Interim Guidance on the Application of Travel and Land Use Forecasting in NEPA publication* (USDOT FHWA, 2010).

The MWCOG Model utilizes a four-step trip-based model framework with feedback between traffic assignment and distribution, as shown in **Figure 2-29**. Calibration of the MWCOG model for the Study focused on screenlines and validation of land use. The MWCOG user guide is included as **Appendix B** and the MWCOG validation memo is included as **Appendix C**.

Figure 2-28: Regional Land Use

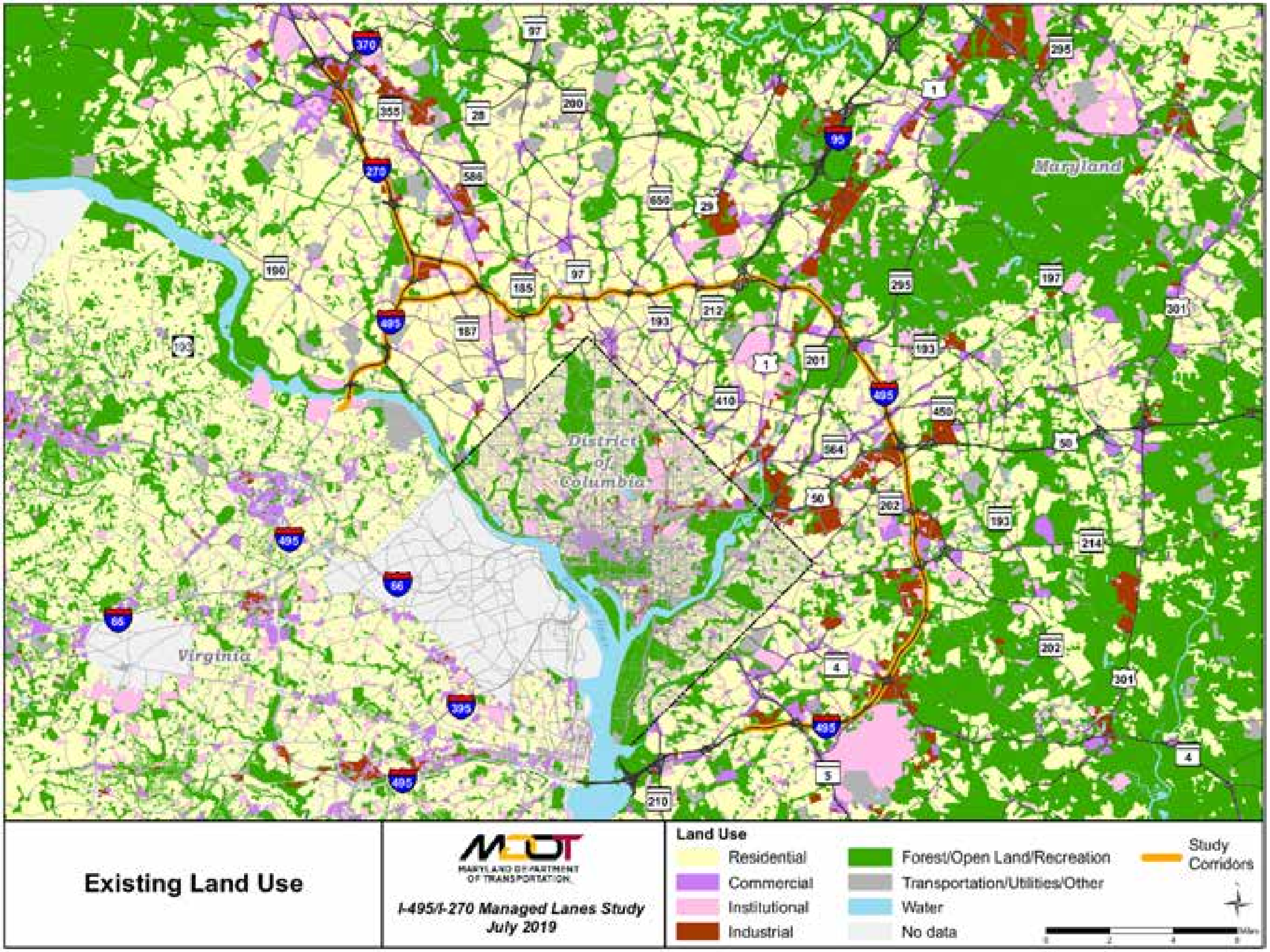
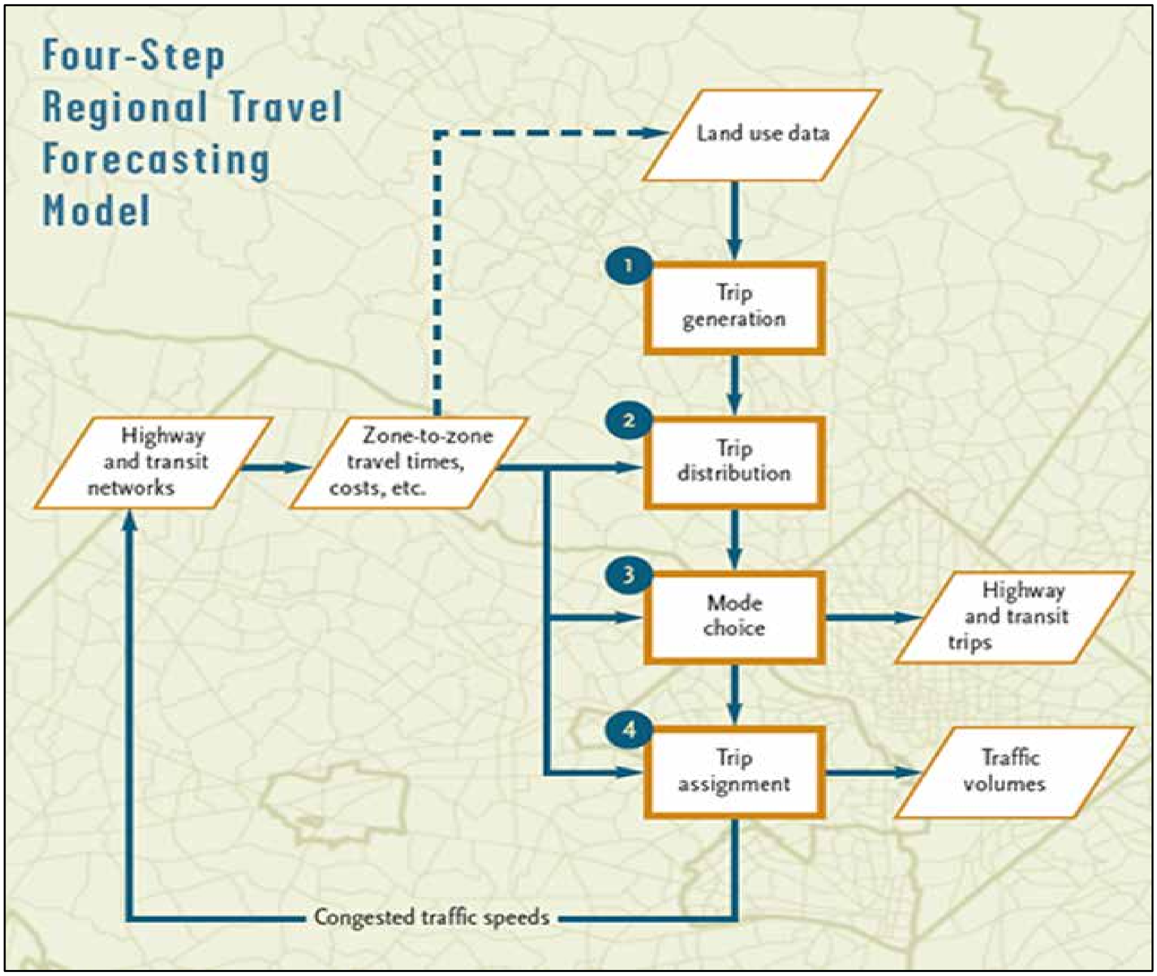


Figure 2-29: Four-Step Regional Travel Forecasting Model



Prior to utilizing the model for analysis, the existing network was reviewed for consistency with field conditions, including links and number of lanes. The model was then validated to ensure reasonable volumes across a set of cutlines (locations) and the corridors and study area were defined to capture the movements in the region. The next several sections describe the models and calibration generated for the I-495 and I-270 corridors using data-driven criteria.

C. Analysis Hours

Regional travel demand models analyze large portions of a day, including peak and off-peak hours. For these purposes, the MWCOG regional travel demand model considers 6:00 AM to 9:00 AM and 3:00 PM to 7:00 PM as the peak periods and the rest of the model time is considered “off-peak”. Except where otherwise noted, analysis results are based on the peak periods. For this Study, where results for the peak hours (i.e., the highest hour of each peak period) are shown, the peak hours were established as 7:00 AM to 8:00 AM and 4:00 PM to 5:00 PM.

D. Background Developments, Capital Projects, and Network Refinements

Calibration is based upon existing conditions. The I-270 ICM improvements, the I-270 at Watkins Mill Road interchange, the Greenbelt Metro Access Improvements, and VDOT NEXT were not included in the baseline model since these improvements were not completed at the time the Study began. Those developments and capital projects are included in the future-year scenarios.

Travel demand forecasts were prepared by the National Capital Region Transportation Planning Board (TPB). Per standard TPB staff modeling practices, prior to executing models for future year alternatives, travel demand model output is validated to existing conditions in the study area. Therefore, TPB executed an existing model validation run and prepared summaries that compare 2016 model estimates to the 2015 observed data they had available. At the time the Study commenced, the 2015 counts were readily available in a format that could easily be used, and more recent counts were not. However, recent history shows that individual facility counts tend to be stable from year to year.

Study inputs were based on Round 9.1 Cooperative Forecasts and the 2018 Constrained Long Range Plan (CLRP), which was approved in 2018. MWCOG then refined the official highway networks to more accurately reflect the study area. These refinements include:

- Review and revisions of the number of lanes on I-495, I-270, and Baltimore-Washington Parkway
- Review and revisions of interchanges with access to/from the above freeways
- Additional refinements in the Fort Meade area, including the addition of the existing National Security Agency (NSA) interchange
- Decrease in highway capacity on Baltimore-Washington Parkway, which is degraded from a freeway to an expressway

The Version 2.3.75 travel demand model is the official TPB “production model” and the approved version for analysis associated with this project. Although it was used as the starting point (or “base” model), MWCOG subsequently modified the model to be able to better represent Build alternatives that include dynamically-priced lanes that do not provide preferential treatment to high occupancy vehicles (which are assumed in all Build alternatives in this Study). Essentially, to reflect this policy assumption, TPB removed what is known as the “HOV Skim Replacement” procedure from the modeling process, so that the revised model is no longer required to perform the “base-run” modeling step for each analysis year. At the same time, the revised model still provides preferential treatment to the HOV carpools using existing HOT lane facilities in Virginia, as HOV users of Virginia HOT lanes can access these dynamically priced lanes free of charge. The resulting regional model used in preparation of the model estimates by TPB for base-year validation and 2045 alternatives analysis is referred to as the Version 2.3.75 travel demand model.

The Version 2.3.71 travel demand model is different from the model used in air quality conformity analysis and was specifically developed for evaluating the differences between this Study’s alternatives. The new methods and features introduced in Version 2.3.71 were incorporated into the following version of the official TPB model with an updated user’s guide, which can be found in **Appendix B**.

As noted above, the DEIS used an earlier version of the MWCOG model, Version 2.3.71, because it was the most recently adopted model at the time the modeling for the MLS was initiated. For the SDEIS and FEIS, MDOT SHA used an updated version of the MWCOG model, Version 2.3.75, which was released in Fall 2018. The DEIS included a sensitivity analysis comparing the 2040 forecasts to the 2045 forecasts (refer to **Appendix J** of the **DEIS, Appendix C**, *Traffic Analysis Technical Report*) and a commitment to include updated 2045 operational analyses for the Preferred Alternative to evaluate how that Alternative would meet the Purpose and Need based on the latest MWCOG model. Therefore, the SDEIS assumed a design year 2045 for the No Build Alternative and Preferred Alternative. That assumption (i.e., a design year of 2045) was carried forward in the FEIS.

E. Volume Validation

Model validation results, which compare 2016 model estimates to 2015 observed data, are included in **Figures 2-30 and 2-31**. The official MWCOG model was used, which MWCOG validates based on the user guide found in **Appendix B**. The MWCOG validation memo is included in **Appendix C**. Validation is based upon the percent difference between estimated and observed volumes at the screenline level, and between link-level model estimates and observed counts.

All the estimated screenline volumes are within +/- 20% of the observed counts, except for Screenline I-270-2 at 33%. Some of the estimated volumes for the Capital beltway screenlines are close to the 20% margin (e.g., Screenline I-495-2).

As shown, most link-level model estimates for I-270 and I-495 are within 25% of the observed counts, with the following exceptions:

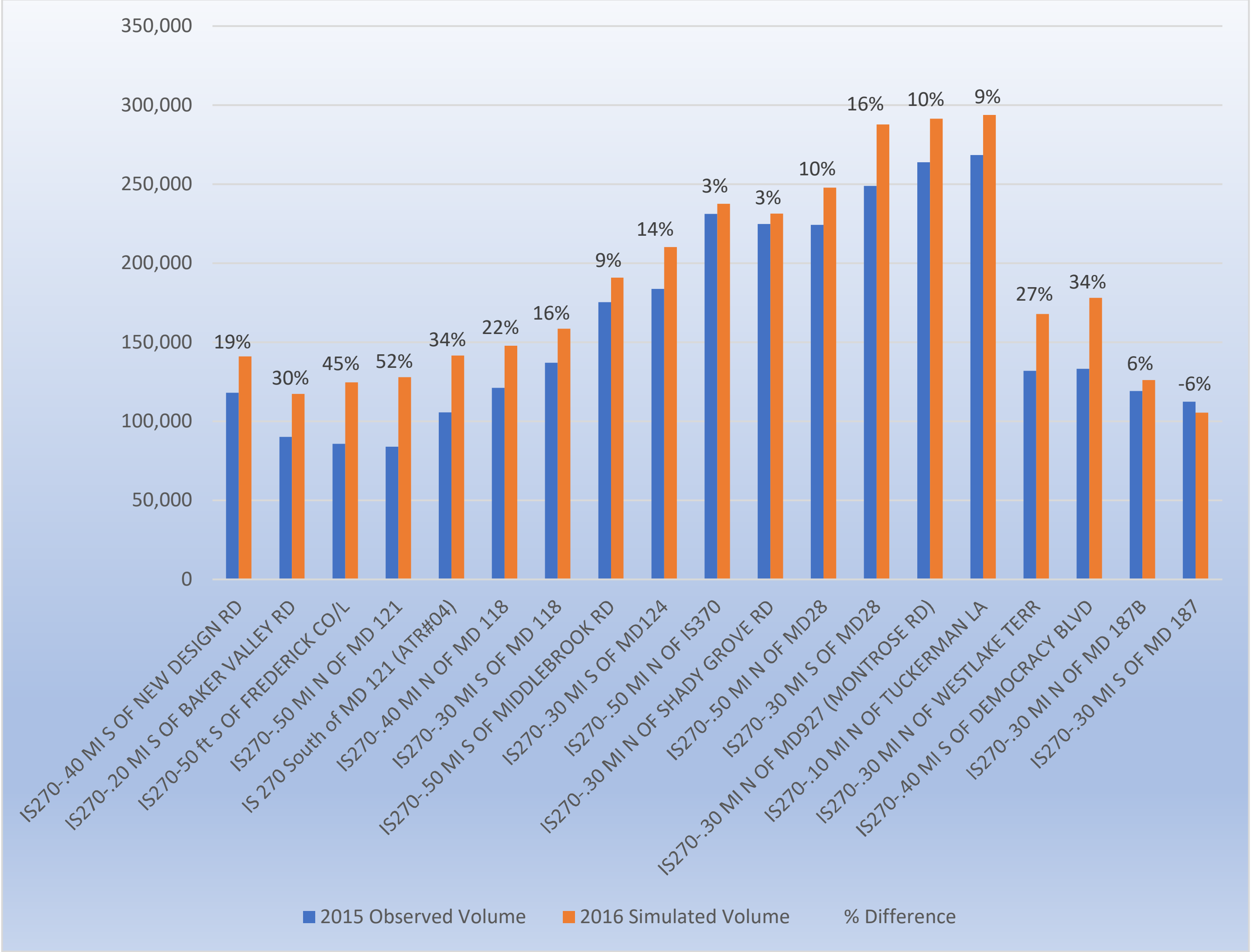
- I-270 – 0.20 mi S of Baker Valley Rd (30%)
- I-270 – 50 ft S of Frederick County Line (45%)
- I-270 – 0.50 mi N of MD 121 (52%)
- I-270 – S of MD 121 (34%)
- I-270 West Spur – 0.30 mi N of Westlake Terrace (27%)
- I-270 West Spur – 0.40 mi S of Democracy Blvd (34%)

It is important to realize that the model results for this study were used to establish growths (or expected changes) for future conditions, which could be applied to known existing volumes (observed counts). The methodology considers both the percent and absolute differences between base year ADT volumes and base year model forecasts for facilities along defined screenlines and applies those same corrections to future year forecasted model volumes.

Figure 2-30: I-495 Observed (2015) vs. Simulated (2016) Average Annual Weekday Daily Traffic Volumes

Note: Links with no count are excluded from screenline totals

Figure 2-31: I-270 Observed (2015) vs. Simulated (2016) AAWDT Volumes



Note: Links with no count are excluded from screenline totals

F. HOV Validation Metrics

HOV lanes are present along I-270 Southbound from I-370 to the I-270 between the East Spur and the West Spur. The HOV lanes continue to MD 187 along the East Spur and to Democracy Boulevard along the West Spur. HOV lanes are present along I-270 Northbound from MD 187 along the East Spur and from Democracy Boulevard along the West Spur, continuing past the merge between the two spurs to MD 117. Existing (2017) modeled volumes in the HOV lanes and general-purpose lanes are shown in **Figures 2-32 through 2-35**, along with the percentage of vehicles using the HOV lanes.

Figure 2-32: Existing (2017) ADTs in HOV and General-Purpose Lanes – I-270 Southbound

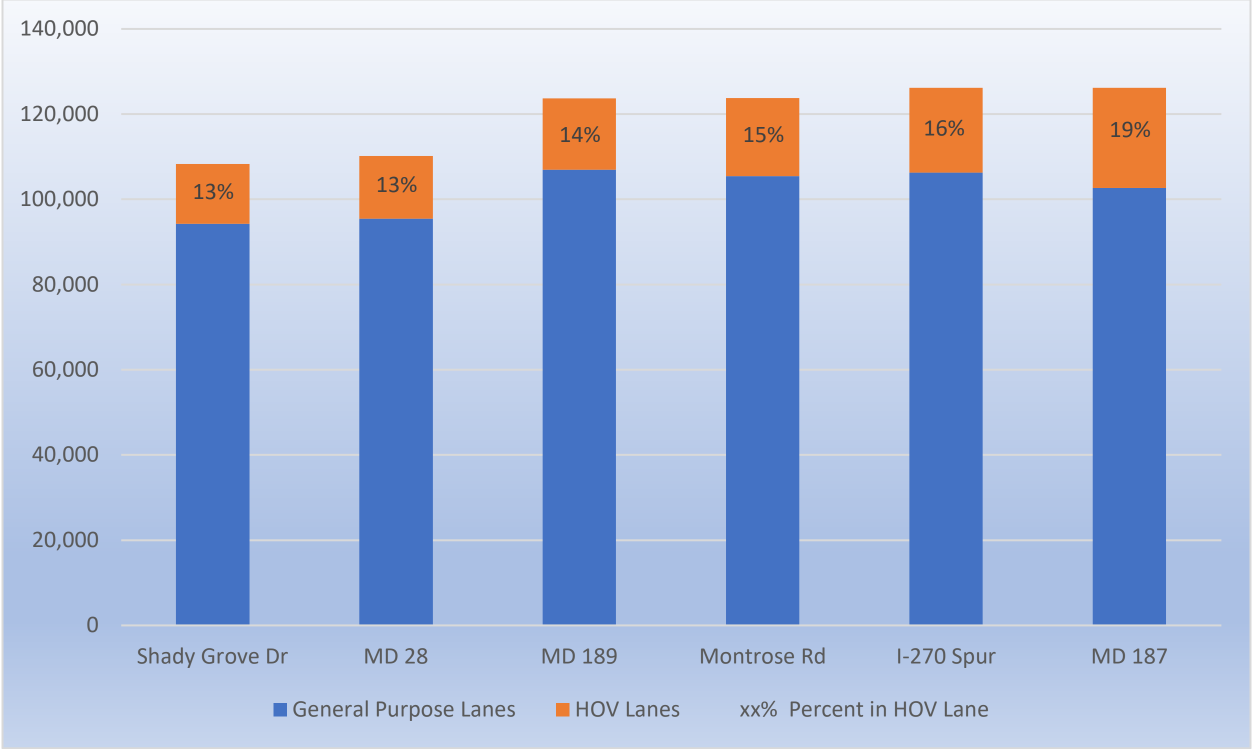
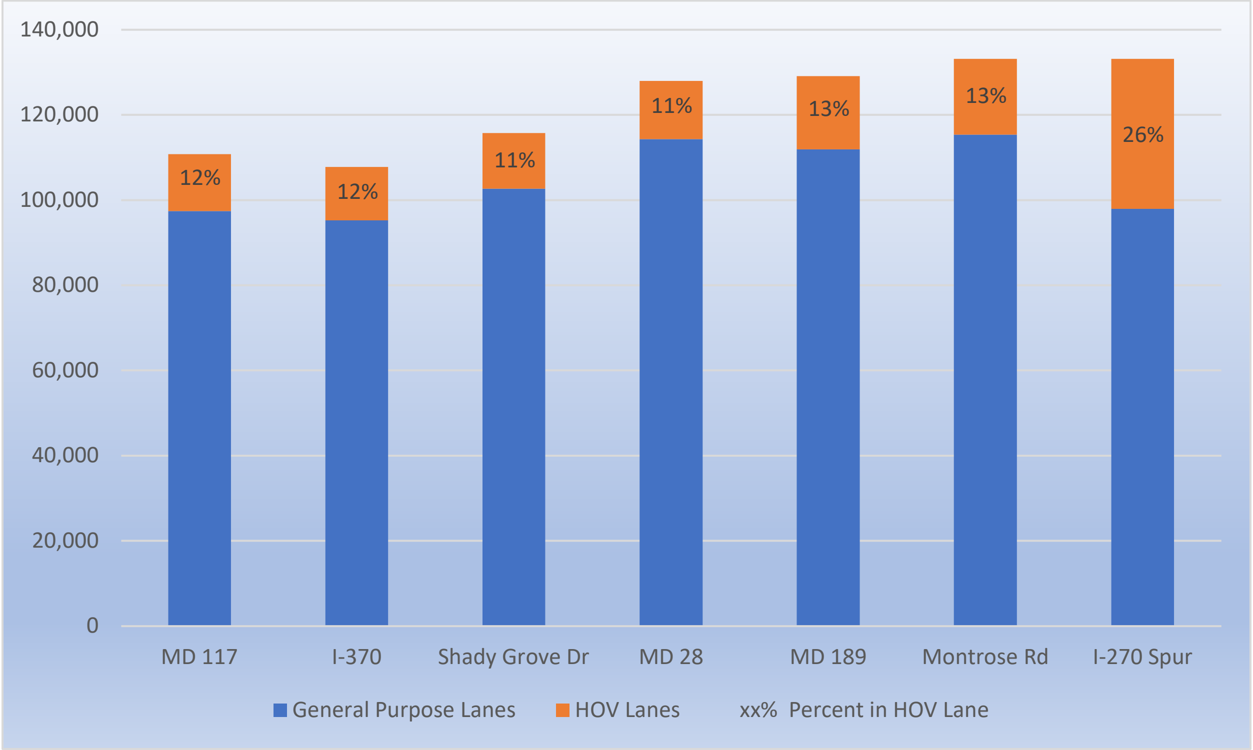


Figure 2-33: Existing (2017) ADTs in HOV and General-Purpose Lanes – I-270 Northbound



Note: HOV lanes are present at MD 117 and I-370 northbound but not southbound

Figure 2-34: Existing (2017) 7-8 AM Peak Hour Volumes in HOV and General-Purpose Lanes – I-270 Southbound

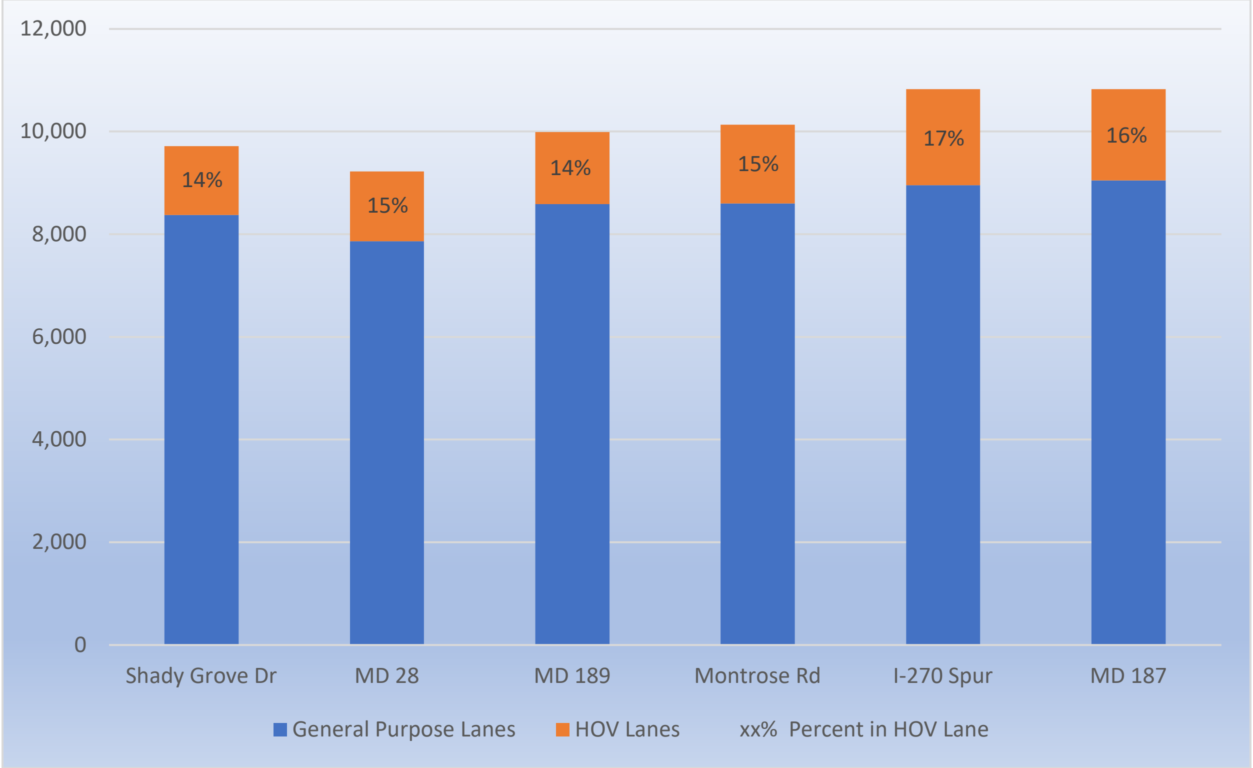
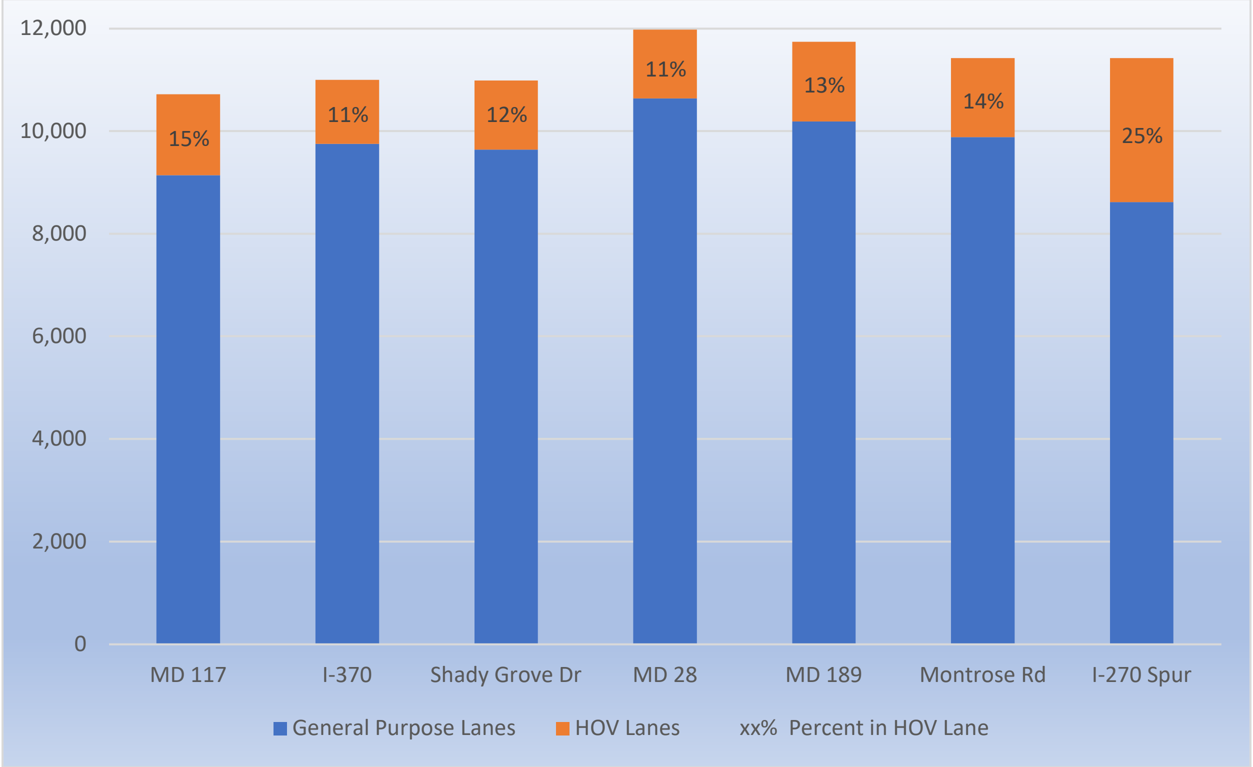


Figure 2-35: Existing (2017) 4-5 PM Peak Hour Volumes in HOV and General-Purpose Lanes – I-270 Northbound



Note: HOV lanes are present along I-270 northbound at MD 117 and I-370 but not southbound

G. MWCOG Screenline Volume Outputs

Average Annual Weekday Daily Traffic (AAWDT) volume outputs at selected screenline locations from the 2016 simulated model are shown in **Figure 2-36**. These screenline locations reflect various locations along the study corridors. Nine locations were included along I-495, including at the Potomac River, east of MD 650, and south of US 50. Six locations were included along I-270, including south of I-70, south of I-370, and north of the I-270 Spurs. Six locations were also included along the Baltimore-Washington Parkway, which was not considered beyond the MWCOG analysis. Note that the selected AAWDT counts/observed data represent the 2015 conditions, while model output represents the 2016 conditions. At the time the Study commenced, the 2015 counts were readily available in a format that could easily be used, and more recent counts were not. However, recent history shows that individual facility counts tend to be stable from year to year. All the estimated screenline volumes (see **Table 2-7**) are within +/- 20% of the observed counts, except for Screenline I-270-2 (at 33%). In addition, some of the estimated volumes for the I-495 screenlines are close to the 20% margin (e.g., Screenline I-495-2). The MWCOG validation memo is included in **Appendix C**. The simulated volumes exclude links with no count. A separate memo, also included in **Appendix C**, includes all links on the screenline. These volumes are included in **Table 2-7** as well as in **Figure 2-36.**

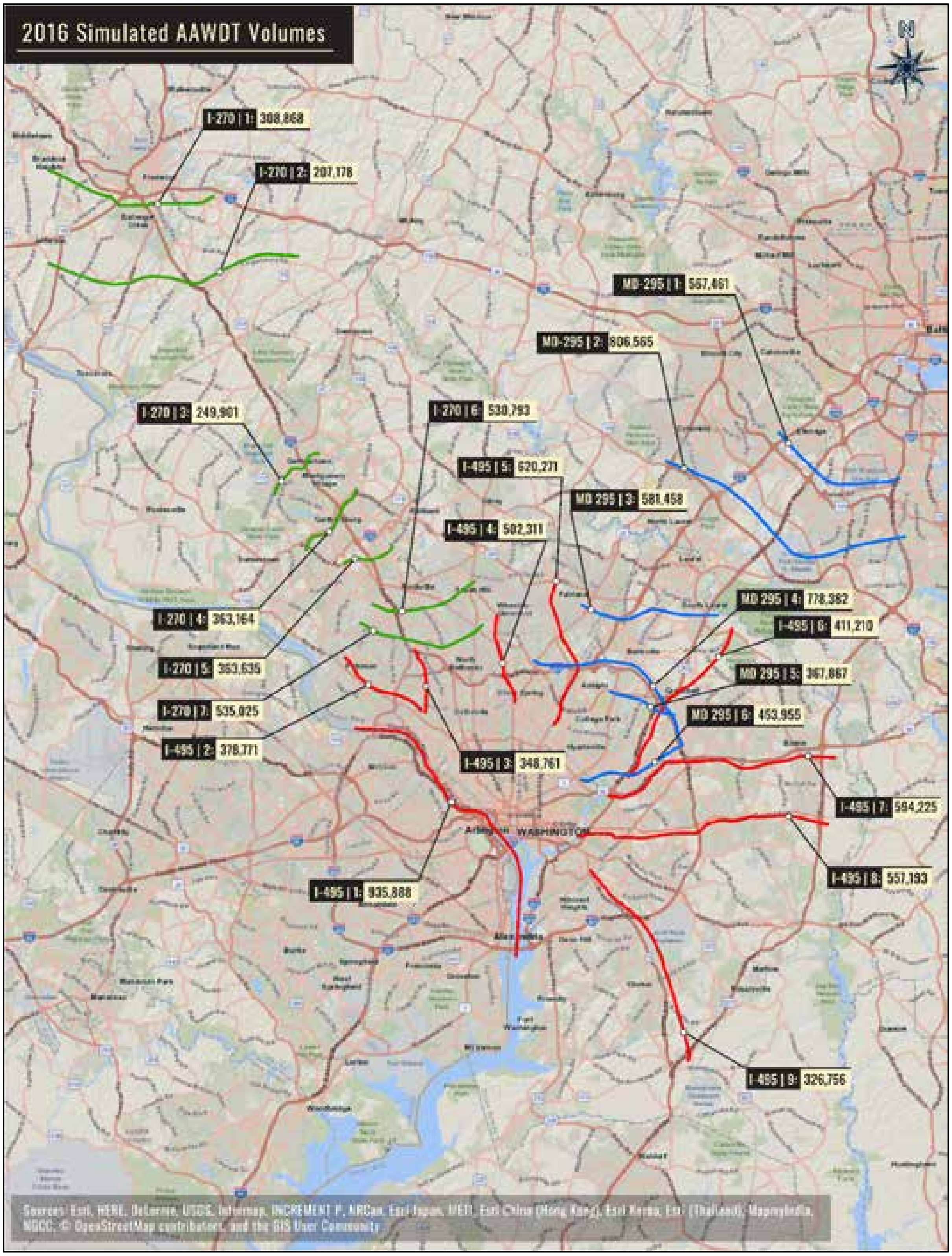
Table 2-7: Observed versus Simulated AAWDT Volumes by Screenline

Screenline	Location	2015 Observed Volume	2016 Simulated Volume (Excluding Links with No Count)*	Percent Difference	2016 Simulated Volume (Including All Links on Screenline)**
I-270-1	South of I-70	288,116	307,940	7%	308,868
I-270-2	North of Fingerboard Rd	138,134	184,326	33%	207,178
I-270-3	South of Germantown Rd	231,104	249,901	8%	249,901
I-270-4	South of Quince Orchard Rd	363,634	359,373	-1%	363,164
I-270-5	South of I-370	338,752	342,027	1%	363,635
I-270-6	North of Montrose Rd	436,266	473,757	9%	530,793
I-270-7	North of the Spurs	425,466	475,267	12%	535,025
I-495-1	Potomac River	916,448	935,888	2%	935,888
I-495-2	North of River Rd	302,322	357,450	18%	378,771
I-495-3	Between the Spurs	294,286	319,958	9%	348,761
I-495-4	West of Georgia Ave	421,760	473,152	12%	502,311
I-495-5	East of New Hampshire Ave	485,514	550,779	13%	620,271
I-495-6	East of Baltimore-Washington Pkwy	393,800	358,883	-9%	411,210
I-495-7	South of US 50	612,422	546,973	-11%	594,225
I-495-8	South of Central Ave	496,968	436,251	-12%	557,193
I-495-9	East of Branch Ave	362,926	298,519	-18%	326,756

* From February 2018 validation memo

**From March 2018 validation memo

Figure 2-36: 2016 Simulated AAWDT Screenline Volumes for I-270 and I-495



Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), Mapmyindia, NGCC, © OpenStreetMap contributors, and the GIS User Community

Note: includes all links on screenline, as detailed in the March 2018 memo in Appendix C

2.12 Microsimulation Model Calibration: VISSIM

A. Definition of the VISSIM Model/Microsimulation

VISSIM, a microsimulation modeling software, was used to develop the network-based operational analysis for the I-495 and I-270 corridors. Version 10.00-09, the most recent version available at the beginning of the modeling process, was used. VISSIM's operational analysis capabilities include, but are not limited to: car, truck, and pedestrian volumes, transit routes and stops, to-scale lane geometry, and complex signal timings. The microsimulation model covers the entire Study corridor, with additional intersections on cross roads to ensure traffic approach and departure patterns were replicated on both I-495 and I-270. All items are input based on field-collected or field-verified data. These input data and their data sources are described below. The latest VISSIM calibration report is included in **Appendix D**.

B. VISSIM Model Calibration Methodology

Model calibration and validation refers to the process that confirms the model provides a reasonable approximation of existing field conditions, and incorporates model refinements to bring it within an accepted range of validation targets. It is important to calibrate your existing year models to reflect actual conditions and then carry that calibration forward to future year conditions, as appropriate. For this Study, the model was run five times per peak period. Calibration of the model followed the guidelines in MDOT SHA's *VISSIM Modeling Guidance* (August 2017) and focused on the following criteria. Detailed calibration thresholds are described in the following sections.

- Vehicle throughput
- Speeds
- Travel times
- Visual confirmation of congestion patterns (queue buildup and dissipation)

During the VISSIM model calibration, attention was given to the following parameters:

- Modifying lane change distances to ensure smooth yet realistic traffic flow in both the peak and off-peak directions
- Modifying driver behavior parameters and link behavior types; driver and link behavior types

C. Hours of Analysis and Inputs

Vehicle inputs and VISSIM static routes were developed based on the existing balanced traffic volumes for the AM peak hours from 5 AM to 6 AM for seeding, and 6 AM to 10 AM for data collection. The evening peak hours developed in VISSIM were based on volumes from 2 PM to 3 PM for seeding, and 3 PM to 7 PM for data collection. The "exact volume" input was set for the arrival distribution for all the vehicle inputs, wherein the volume coded in is used in every simulation (as opposed to the "stochastic" input in which volumes vary slightly with each simulation). A series of vehicle compositions were set up for peak hour vehicle inputs throughout the network, based on the vehicle classification counts at various locations.

D. Background Developments or Capital Projects

No background developments were included as this calibration applies to existing 2017 conditions. The I-270 ICM improvements were not included in the baseline because these mitigation strategies were not completed at the time the Study was undertaken. Similarly, the I-270 at Watkins Mill Road interchange, the Greenbelt Metro access improvements, and VDOT NEXT, which were not completed at the time this Study was initiated, were also not included.

E. Speed Data Fluctuation Threshold

Unreliability is important not only to better understand the need for new modes of transport along the corridors, but also for determining the detailed simulation model thresholds for calibration. Based on the unreliability of the I-270 and I-495 corridors, and on the guidance in MDOT SHA's *VISSIM Modeling Guidance* that mainline speeds should be modeled as a distribution of existing speeds along the corridor, calibration thresholds were set according to the results of the RITIS platform probe data. The calibration thresholds for the AM peak period, based on probe data from RITIS were:

- ±15 mph for I-495 Inner Loop in the AM peak hour
- ±14 mph for I-495 Outer Loop in the AM peak hour
- ±17 mph for I-270 Southbound in the AM peak hour
- ±6 mph for I-270 Northbound in the AM peak hour

The calibration thresholds for the PM peak period based on probe data from RITIS were:

- ±16 mph for I-495 Inner Loop in the PM peak hour
- ±19 mph for I-495 Outer Loop in the PM peak hour
- ±12 mph for I-270 Southbound in the PM peak hour
- ±16 mph for I-270 Northbound in the PM peak hour

The volume calibration threshold was 10% for throughput volumes, in concurrence with MDOT SHA's *VISSIM Modeling Guidance*.

These targets were chosen based on the complexity and size of the network and the variability of travel time runs along certain travel time segments. Priority was given to corridor travel speeds since it is an important measure of effectiveness for evaluation.

F. VISSIM Calibration Outputs and Summary

The outputs of the VISSIM calibration are summarized below in **Tables 2-8 to 2-10.** Average speeds along I-495 and I-270, as collected in May 2017 and as simulated in the VISSIM models can be found in **Figures 2-37 through 2-42**. Detailed speed and travel time data can be found in **Appendix E**.

Calibration was based on speeds and as a result, travel times. These tables show the travel time along the I-495 and I-270 corridors, the length and percentage of each corridor meeting the calibration thresholds, and the length and percentage of each segment over 0.5 miles long meeting the calibration thresholds during the 8-9 AM and 5-6 PM peak hours. Most evaluation periods show close correlation in terms of speed and travel time with some exceptions:

- I-270 Southbound from 6 AM to 8 AM
- I-270 Northbound from 3 PM to 7 PM

For the longer segment evaluation of the 8-9 AM and 5-6 PM peak hours, 80% to 83% of I-495 Inner Loop segments met the calibration thresholds, and 75% to 79% of I-495 Outer Loop segments met the calibration thresholds. Along I-270 Southbound, 73% of segments met the calibration thresholds during the 8-9 AM peak hour and 89% of segments met the calibration thresholds during the PM peak hour. Along I-270 Northbound, 94% of segments met the calibration thresholds during the 8-9 AM peak hour, but only 36% of segments met the calibration thresholds during the PM peak hour. Except for I-270 during the PM peak hour, most of the longer evaluated segments met the speed thresholds.

It should be noted that the speeds are reflective of May 2017 data, but the volumes were collected over multiple days, months, and years. Due to the size of the study area, there was not a cost-effective method to collect all volume data on the same day. Additionally, due to oversaturated conditions along both corridors, the traffic conditions are very volatile and can change dramatically from day to day. The goal of calibrating the existing model is to develop a model that is reasonably representative of a typical day along the corridor, while also considering the volatility of the corridor and reliability of each data set.

The VISSIM study area network for the I-270 and I-495 Managed Lane Study is larger and more complex than most traffic simulation models, due to the duration of daily congestion and variability of the day-to-day traffic speeds and volumes along the corridors. When evaluating the combination of model speeds and traffic volumes compared to the field-collected data, while also considering the variability along the corridor, the model were considered to be reasonably calibrated, thereby providing the sensitivity necessary to evaluate the future year conditions for alternative analysis.

Table 2-8: VISSIM Outputs of Existing Calibration: Travel Times

Segment	Length (miles)	Time Period	Field Travel Time (min)	Simulated Travel Time (min)	Difference (min)	Difference (%)
I-495 Inner Loop	43.3	6-7 AM	43.4	46.0	-2.6	-6%
		7-8 AM	65.8	54.6	11.2	17%
		8-9 AM	66.2	53.1	13.0	20%
		9-10 AM	53.2	50.3	3.0	6%
		3-4 PM	72.9	64.0	8.9	12%
		4-5 PM	97.4	84.8	12.7	13%
		5-6 PM	109.2	104.6	4.5	4%
		6-7 PM	86.7	94.9	-8.2	-9%
I-495 Outer Loop	43.6	6-7 AM	49.3	54.1	-4.9	-10%
		7-8 AM	69.6	66.8	2.8	4%
		8-9 AM	79.9	69.1	10.8	13%
		9-10 AM	64.7	61.8	2.9	5%
		3-4 PM	63.7	62.6	1.1	2%
		4-5 PM	77.3	71.4	5.9	8%
		5-6 PM	81.5	83.6	-2.2	-3%
		6-7 PM	65.8	84.8	-19.0	-29%
I-270 Southbound	31.3	6-7 AM	48.3	51.5	-3.2	-7%
		7-8 AM	61.7	59.9	1.8	3%
		8-9 AM	56.9	48.8	8.1	14%
		9-10 AM	42.8	41.6	1.3	3%
		3-4 PM	29.4	30.9	-1.5	-5%
		4-5 PM	31.4	31.3	0.0	0%
		5-6 PM	32.9	31.7	1.2	4%
		6-7 PM	30.1	31.3	-1.1	-4%
I-270 Northbound	33.1	6-7 AM	28.5	29.5	-1.0	-4%
		7-8 AM	28.5	29.7	-1.1	-4%
		8-9 AM	28.7	29.8	-1.1	-4%
		9-10 AM	29.3	29.8	-0.5	-2%
		3-4 PM	44.5	41.0	3.5	8%
		4-5 PM	53.9	44.4	9.5	18%
		5-6 PM	65.5	50.3	15.1	23%
		6-7 PM	46.6	49.1	-2.4	-5%

Note: MDOT SHA's VISSIM Modeling Guidance requires that travel times along the entire corridor be calibrated to within 5%; however, due to the complexity of the network, some segments are outside this range

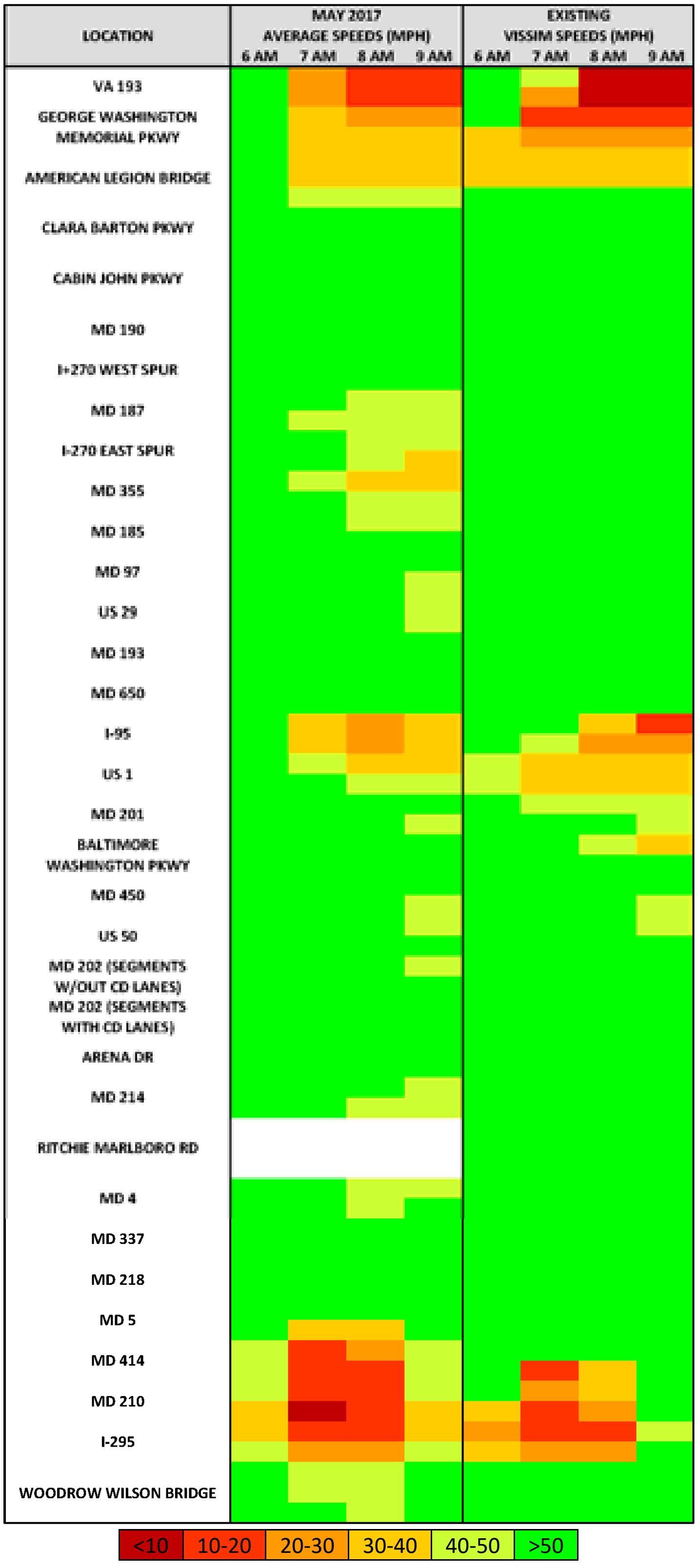
Table 2-9: VISSIM Outputs of Calibration: Segment Compliance Summary

Segment	Length (miles)	Time Period	Total Length of Segments Meeting Volume Criteria		Total Length of Segments Meeting Speed Criteria		Total Length of Segments Meeting Both Volume and Speed Criteria	
			Miles	%	Miles	%	Miles	%
I-495 Inner Loop	43.3	6-7 AM	11.6	26.7%	41.4	95.7%	11.6	26.7%
		7-8 AM	11.7	27.0%	37.0	85.5%	13.0	30.1%
		8-9 AM	5.8	13.4%	36.8	85.1%	4.6	10.6%
		9-10 AM	5.5	12.7%	37.4	86.5%	5.5	12.7%
		3-4 PM	16.3	37.7%	33.6	77.5%	12.5	28.8%
		4-5 PM	5.8	13.5%	37.0	85.5%	5.8	13.5%
		5-6 PM	11.4	26.4%	35.3	81.5%	10.3	23.8%
		6-7 PM	12.0	27.7%	38.0	87.7%	11.4	26.4%
I-495 Outer Loop	43.6	6-7 AM	14.0	32.2%	40.1	92.0%	11.4	26.2%
		7-8 AM	13.9	31.8%	34.5	79.2%	13.6	31.1%
		8-9 AM	10.9	25.1%	34.6	79.3%	8.0	18.5%
		9-10 AM	7.8	17.8%	34.7	79.6%	40.8	93.5%
		3-4 PM	29.5	67.8%	31.5	72.2%	20.7	47.4%
		4-5 PM	23.1	52.9%	29.8	68.4%	15.3	35.1%
		5-6 PM	18.4	42.3%	31.9	73.3%	10.9	25.1%
		6-7 PM	16.4	37.7%	37.1	85.2%	13.3	30.5%
I-270 Southbound	33.3	6-7 AM	3.2	9.6%	25.1	75.3%	3.0	8.9%
		7-8 AM	1.3	3.9%	29.3	87.9%	1.3	3.9%
		8-9 AM	3.5	10.5%	24.8	74.4%	3.5	10.5%
		9-10 AM	12.3	36.9%	28.5	85.5%	11.3	33.8%
		3-4 PM	18.1	54.2%	31.1	93.2%	18.1	54.2%
		4-5 PM	17.3	52.0%	31.1	93.2%	17.3	52.0%
		5-6 PM	23.2	69.4%	29.9	89.7%	23.2	69.4%
		6-7 PM	8.1	24.2%	30.6	91.8%	8.1	24.2%
I-270 Northbound	33.1	6-7 AM	6.0	18.3%	31.1	94.0%	6.0	18.3%
		7-8 AM	20.2	61.1%	31.1	94.0%	19.2	58.1%
		8-9 AM	20.8	62.9%	31.1	93.9%	19.9	60.0%
		9-10 AM	8.3	24.9%	30.9	93.4%	7.3	22.0%
		3-4 PM	1.0	3.0%	23.1	69.8%	0.0	0.0%
		4-5 PM	0.7	2.1%	20.4	61.5%	0.7	2.1%
		5-6 PM	1.0	3.1%	12.5	37.6%	0.1	0.2%
		6-7 PM	2.0	6.0%	25.7	77.7%	0.0	0.0%

Table 2-10: VISSIM Outputs of Calibration: Long Segments Compliance Summary

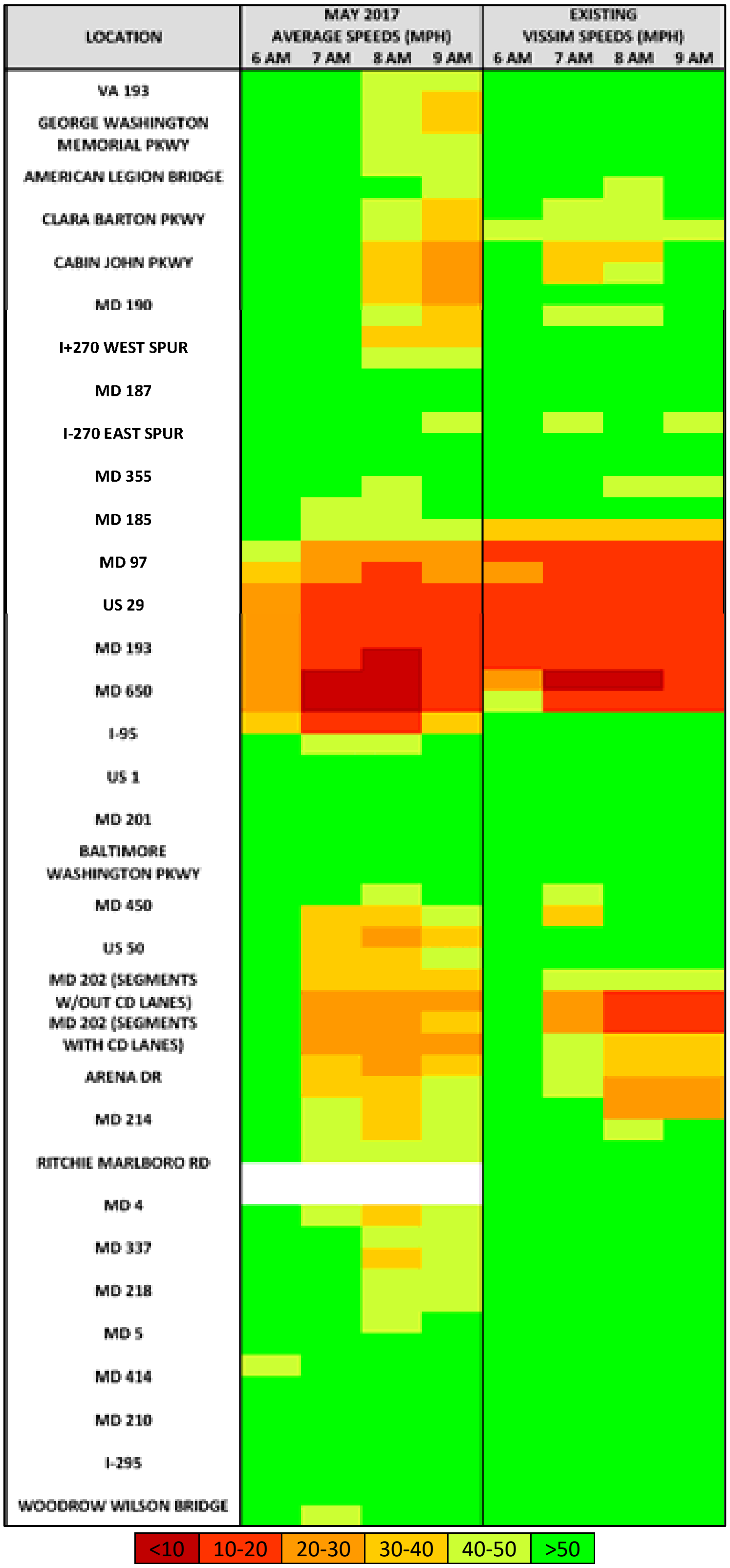
Segment	Total Length of Segments (Length ≥ 0.5 Miles) (Miles)	Time Period	Total Length of Segments (Length ≥ 0.5 Miles) Meeting Volume Criteria		Total Length of Segments (Length ≥ 0.5 Miles) Meeting Speed Criteria		Total Length of Segments (Length ≥ 0.5 Miles) Meeting Both Volume and Speed Criteria	
			Miles	%	Miles	%	Miles	%
I-495 Inner Loop	33.1	8-9 AM	5.8	17.5%	27.3	82.6%	4.6	13.8%
		5-6 PM	8.3	25.2%	26.5	80.0%	7.2	21.8%
I-495 Outer Loop	34.9	8-9 AM	9.5	27.3%	27.4	78.5%	7.1	20.3%
		5-6 PM	14.7	42.0%	26.2	75.1%	8.4	24.0%
I-270 Southbound	29.9	8-9 AM	3.3	11.0%	21.9	73.2%	3.3	11.0%
		5-6 PM	20.2	67.6%	26.7	89.4%	20.2	67.6%
I-270 Northbound	31.0	8-9 AM	18.9	60.8%	29.0	93.6%	17.9	57.7%
		5-6 PM	1.0	3.2%	11.2	36.2%	0.0	0.0%

Figure 2-37: I-495 Inner Loop Existing (2017) AM Peak Period Average Speeds – RITIS and VISSIM



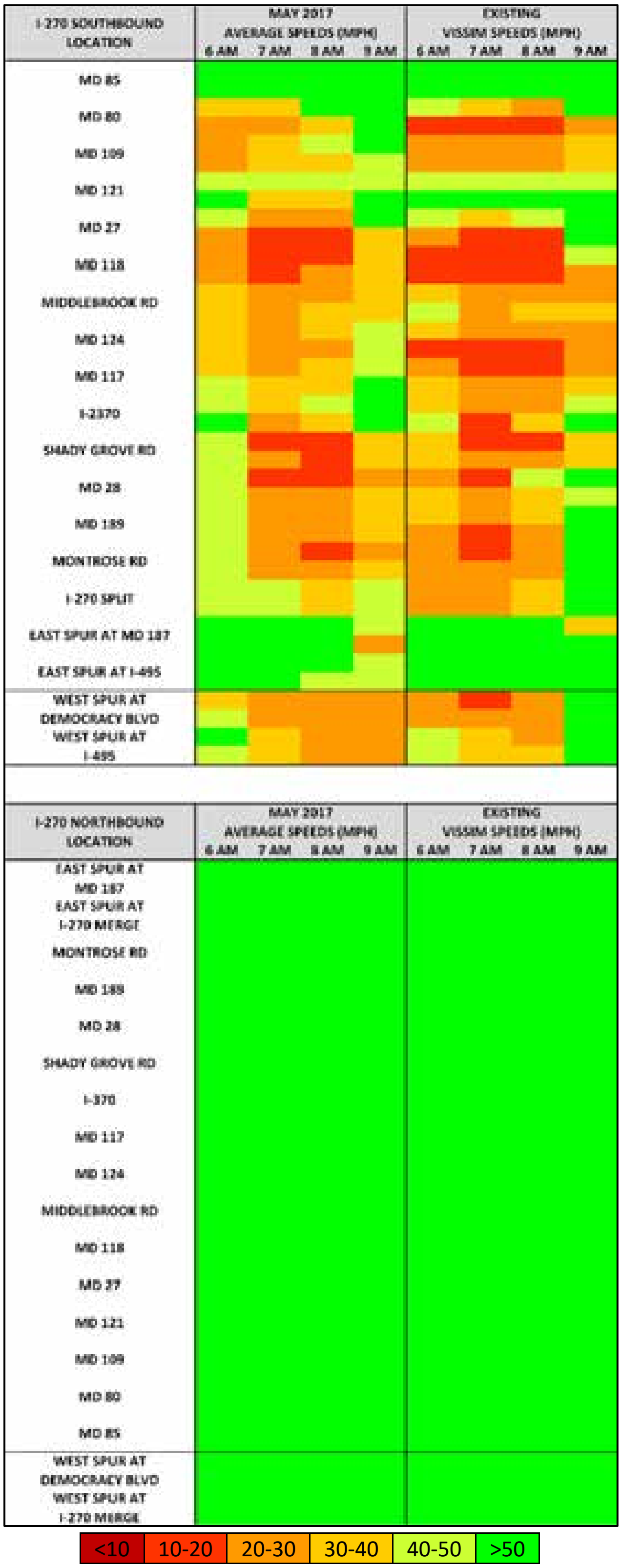
Note: White areas indicate missing data

Figure 2-38: I-495 Outer Loop Existing (2017) AM Peak Period Average Speeds – RITIS and VISSIM



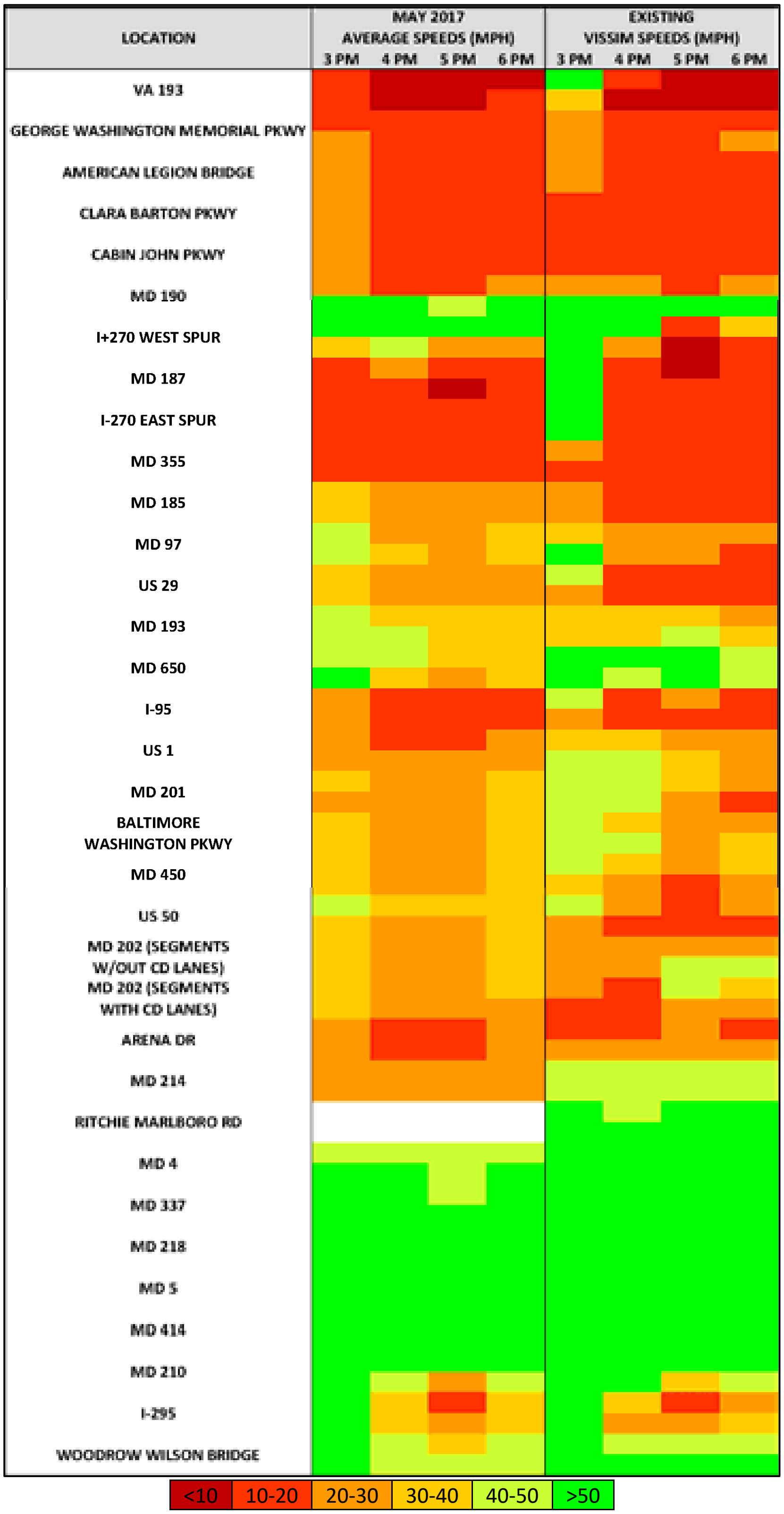
Note: White areas indicate missing data

Figure 2-39: I-270 Existing (2017) AM Peak Period Average Speeds – RITIS and VISSIM



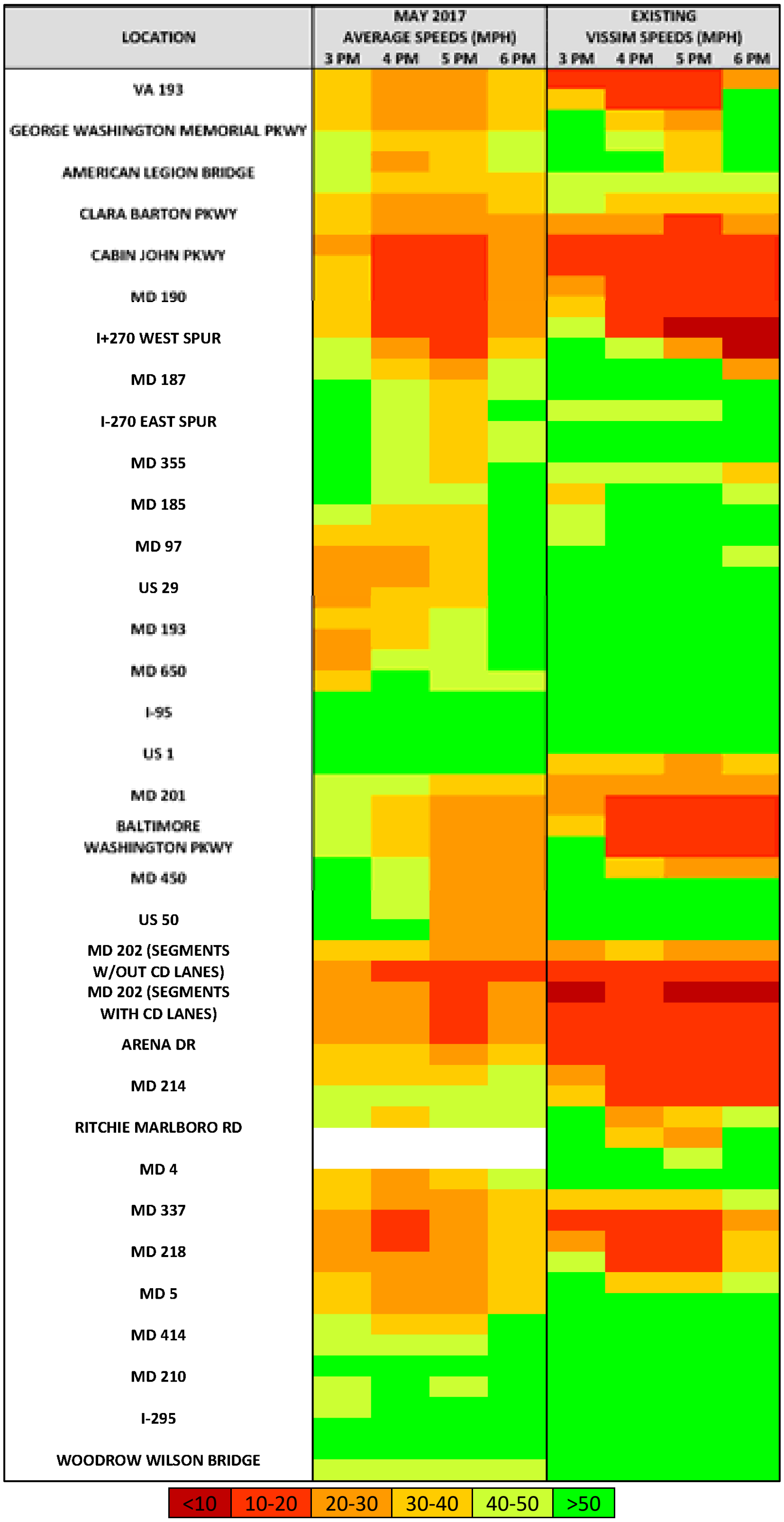
Note: White areas indicate missing data

Figure 2-40: I-495 Inner Loop Existing (2017) PM Peak Period Average Speeds – RITIS and VISSIM



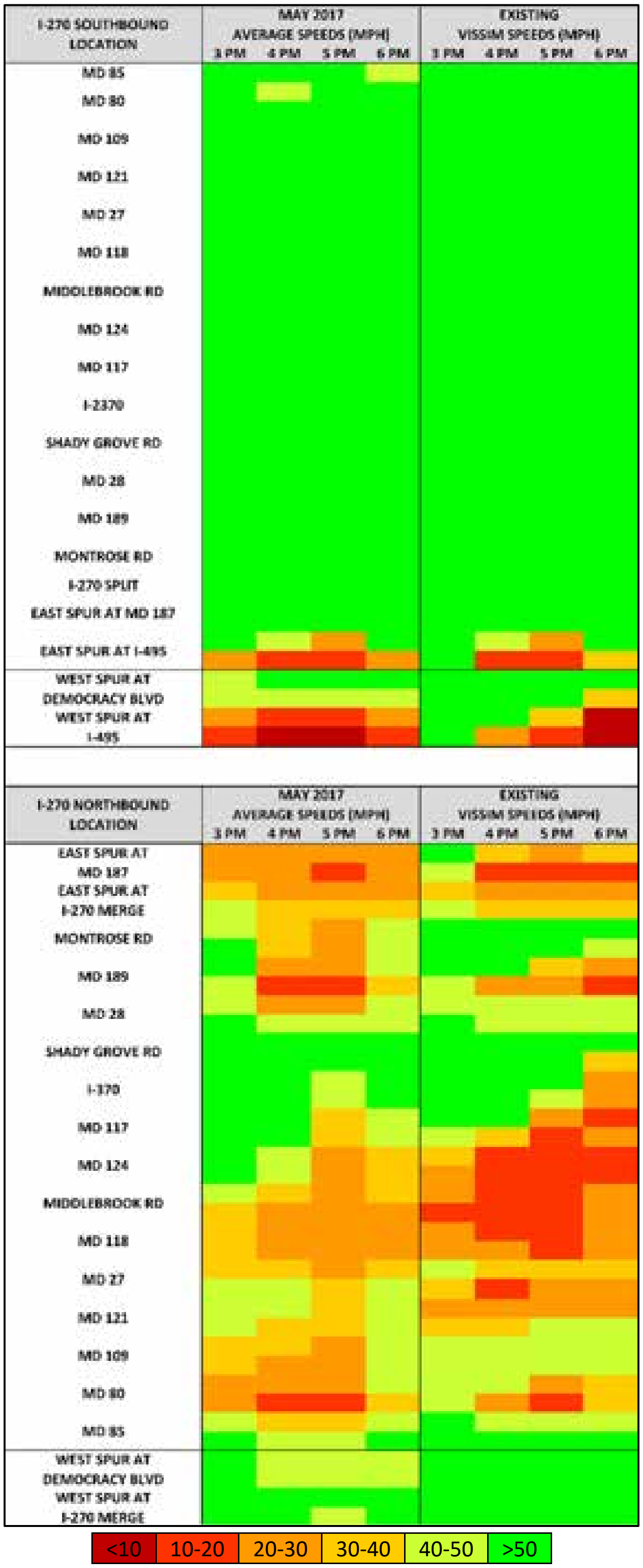
Note: White areas indicate missing data

Figure 2-41: I-495 Outer Loop Existing (2017) PM Peak Period Average Speeds – RITIS and VISSIM



Note: White areas indicate missing data

Figure 2-42: I-270 Existing (2017) PM Peak Period Average Speeds – RITIS and VISSIM



3 SUMMARY OF BASELINE CONDITIONS

Building upon the previous discussion about the gathered data and how it can help to calibrate models, those models are then used for the development of the MOEs that have been previously discussed. Summarized below are the MOEs that were evaluated for this Study.

Key Points

- The average travel time for vehicles in the VISSIM model is 32.3 minutes.
- Of that, 13 minutes (40% of the commute) is delay.
- This equates to 2.25 hours of delay per week, and 117 hours of delay per year, per commuter.

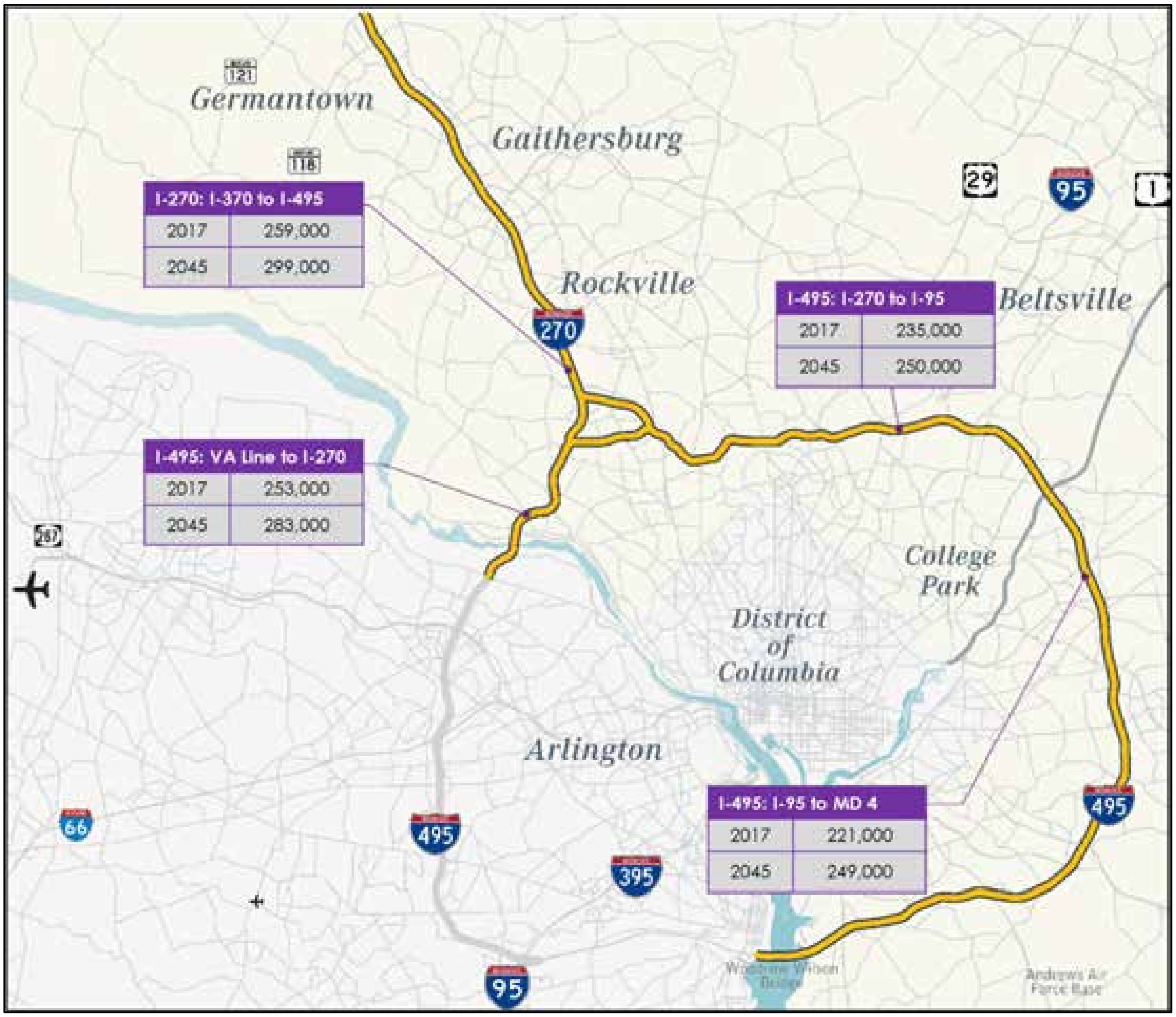
3.1 Average Daily Traffic

Figure 3-1 provides a summary of existing (2017) and future (2045) average daily traffic (ADT) along the Study roadways. The development of future volumes will be detailed in section 4 of this report.

3.2 Travel Times and Speeds

Figures 2-37 through 2-42, as previously discussed, show the average speeds along I-495 and I-270 as collected in May 2017, and in the VISSIM models. Detailed speed and travel time data can be found in **Appendix E**.

Figure 3-1: Average Daily Traffic (ADT) along Study Roadways



3.3 Vehicle Demand, Throughput, and Percent Demand Met

Throughput represents the number of vehicles and/or people that pass by a given point in the roadway network in a set amount of time. Throughput quantifies the efficiency of the roadway network in getting people, goods, and services to their destinations. Benefits of increased throughput on the highway include reduced peak spreading (i.e., less congestion in the off-peak hours) and reduced burden on the surrounding roadway network.

Existing travel demand and throughput at four key locations along the Study corridors are summarized in the following tables and figures. These locations cover the four main segments of the study area, separated by major freeway junctions (I-495 at I-95 and I-495 at I-270), and are therefore representative of the study area as a whole. For a complete set of demand and throughput results for all segments, refer to **Appendix F** and **Appendix G**. Person throughputs are based upon vehicle classification outputs, including classifications for HOV 2 and HOV 3+, in the MWCOG model. Percent vehicle demand met (**Table 3-4**) refers to the vehicle throughputs (**Table 3-2**) as a percentage of travel demand (**Table 3-1**).

Table 3-1: I-495 and I-270 Existing (2017) Travel Demand

Location	Travel Demand (vehicles per hour)							
I-495 Inner Loop/ I-270 Southbound	**6-7 AM**	**7-8 AM**	**8-9 AM**	**9-10 AM**	**3-4 PM**	**4-5 PM**	**5-6 PM**	**6-7 PM**
American Legion Bridge	8,100	9,500	9,200	8,600	8,600	8,500	8,700	7,500
I-495 West of I-95	7,000	8,500	7,900	7,000	8,800	9,100	8,500	7,500
I-495 at MD 5	6,300	6,300	6,900	6,200	5,800	6,800	7,000	6,400
I-270 at Montrose Rd	9,300	10,800	10,000	9,100	6,700	7,300	7,500	6,900
I-495 Outer Loop/ I-270 Northbound	**6-7 AM**	**7-8 AM**	**8-9 AM**	**9-10 AM**	**3-4 PM**	**4-5 PM**	**5-6 PM**	**6-7 PM**
American Legion Bridge	7,800	9,100	9,000	8,200	8,300	8,600	8,400	7,900
I-495 West of I-95	8,400	7,400	6,400	6,600	7,400	7,900	8,200	6,900
I-495 at MD 5	5,900	6,700	5,900	5,500	6,800	6,700	6,700	5,800
I-270 at Montrose Rd	4,200	6,100	8,300	7,500	10,500	11,400	11,400	10,700

Table 3-2: I-495 and I-270 Existing (2017) Vehicle Throughputs

Location	Throughput (vehicles per hour)							
I-495 Inner Loop/ I-270 Southbound	**6-7 AM**	**7-8 AM**	**8-9 AM**	**9-10 AM**	**3-4 PM**	**4-5 PM**	**5-6 PM**	**6-7 PM**
American Legion Bridge	8,000	8,300	8,200	8,000	8,300	8,000	7,300	8,800
I-495 West of I-95	7,200	8,100	7,800	7,100	8,100	8,300	8,000	7,300
I-495 at MD 5	6,500	6,000	6,500	6,500	6,000	6,900	7,300	7,100
I-270 at Montrose Rd	9,600	10,100	9,800	9,600	6,700	7,400	7,500	6,900
I-495 Outer Loop/ I-270 Northbound	**6-7 AM**	**7-8 AM**	**8-9 AM**	**9-10 AM**	**3-4 PM**	**4-5 PM**	**5-6 PM**	**6-7 PM**
American Legion Bridge	8,100	8,800	9,200	8,600	8,100	8,300	7,700	7,700
I-495 West of I-95	8,200	6,500	6,400	6,700	6,900	7,300	7,900	7,300
I-495 at MD 5	5,700	6,300	5,700	5,400	6,700	6,700	6,500	5,700
I-270 at Montrose Rd	5,000	6,200	8,400	8,000	10,500	11,400	11,400	10,700

Table 3-3: I-495 and I-270 Existing (2017) Person Throughputs

Location	Throughput (persons per hour)							
I-495 Inner Loop/ I-270 Southbound	**6-7 AM**	**7-8 AM**	**8-9 AM**	**9-10 AM**	**3-4 PM**	**4-5 PM**	**5-6 PM**	**6-7 PM**
American Legion Bridge	9,500	9,900	9,700	9,500	10,800	10,400	9,500	11,400
I-495 West of I-95	8,400	9,400	9,100	8,200	10,200	10,500	10,100	9,200
I-495 at MD 5	7,700	7,100	7,700	7,700	7,800	8,900	9,500	9,200
I-270 at Montrose Rd	11,700	12,300	11,900	11,700	8,900	9,800	9,900	8,400
I-495 Outer Loop/ I-270 Northbound	**6-7 AM**	**7-8 AM**	**8-9 AM**	**9-10 AM**	**3-4 PM**	**4-5 PM**	**5-6 PM**	**6-7 PM**
American Legion Bridge	9,600	10,400	10,900	10,200	10,500	10,800	10,000	10,000
I-495 West of I-95	9,500	7,600	7,400	7,800	8,700	9,200	10,000	9,200
I-495 at MD 5	6,700	7,500	6,700	6,400	8,700	8,700	8,400	7,400
I-270 at Montrose Rd	6,100	7,600	10,200	9,800	12,800	13,900	13,900	13,100

Table 3-4: I-495 and I-270 Existing (2017) Percent Vehicle Demand Met

Location	Percent Vehicle Demand Met							
I-495 Inner Loop/ I-270 Southbound	**6-7 AM**	**7-8 AM**	**8-9 AM**	**9-10 AM**	**3-4 PM**	**4-5 PM**	**5-6 PM**	**6-7 PM**
American Legion Bridge	99%	87%	89%	93%	97%	95%	84%	100%
I-495 West of I-95	100%	96%	98%	100%	93%	91%	94%	98%
I-495 at MD 5	100%	96%	94%	100%	100%	100%	100%	100%
I-270 at Montrose Rd	100%	93%	98%	100%	100%	100%	100%	100%
I-495 Outer Loop/ I-270 Northbound	**6-7 AM**	**7-8 AM**	**8-9 AM**	**9-10 AM**	**3-4 PM**	**4-5 PM**	**5-6 PM**	**6-7 PM**
American Legion Bridge	100%	97%	100%	100%	98%	96%	92%	98%
I-495 West of I-95	97%	87%	100%	100%	94%	92%	96%	100%
I-495 at MD 5	97%	94%	96%	98%	99%	99%	97%	99%
I-270 at Montrose Rd	100%	100%	100%	100%	100%	96%	98%	100%

<90% ≥90% 100%

Figure 3-2: I-495 Existing (2017) 7-8 AM Inner Loop Demand vs. Throughput and Percent Demand Unserved

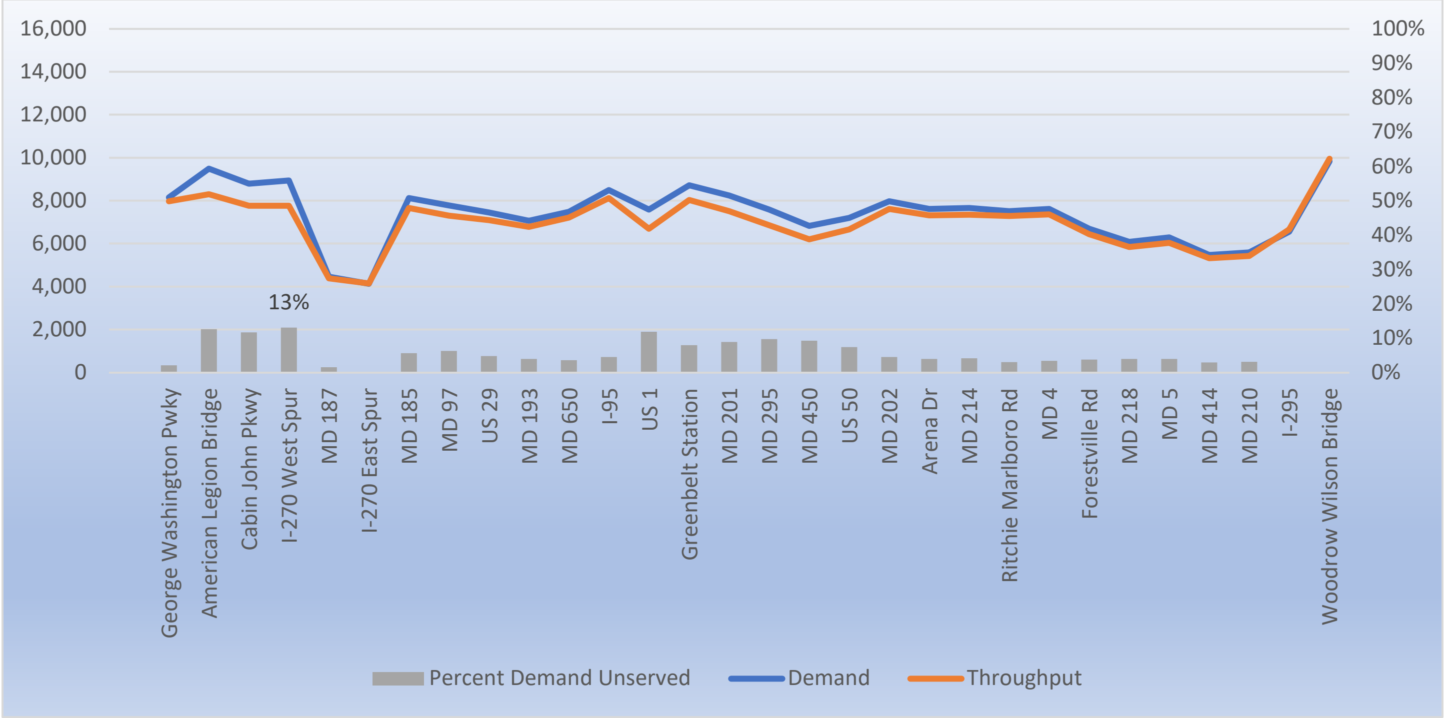
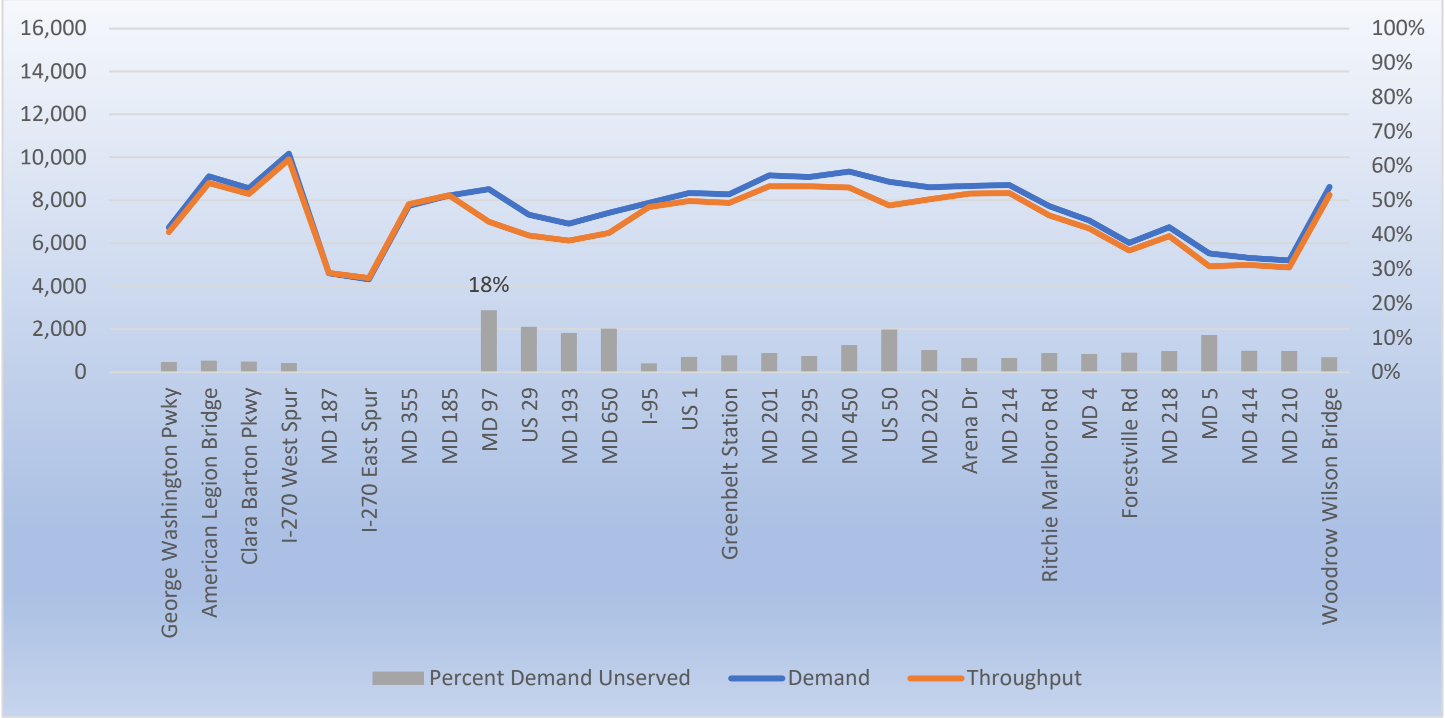


Figure 3-3: I-495 Existing (2017) 7-8 AM Outer Loop Demand vs. Throughput and Percent Demand Unserved



Demand Unserved is the demand that is not met; it is shown as the percent difference between demand and throughput.

Figure 3-4: I-495 Existing (2017) 4-5 PM Inner Loop Demand vs. Throughput and Percent Demand Unserved

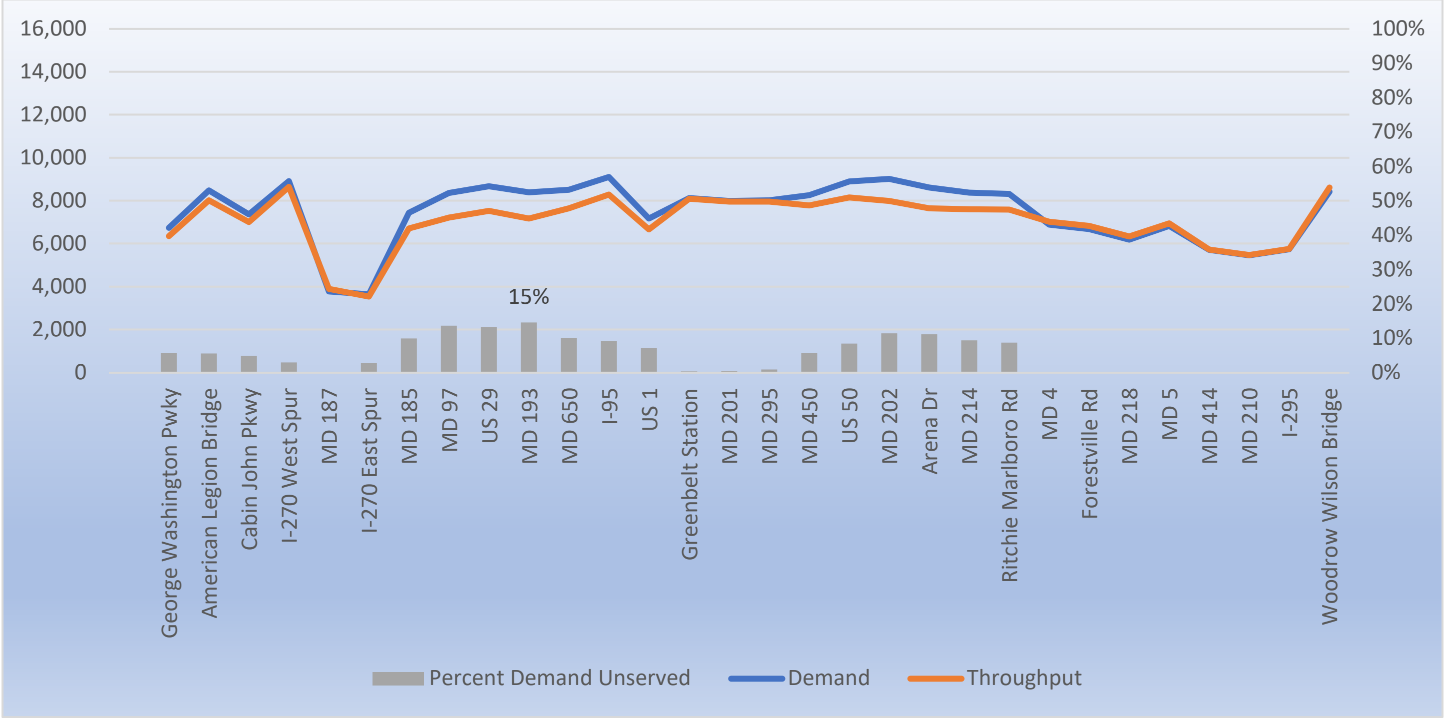
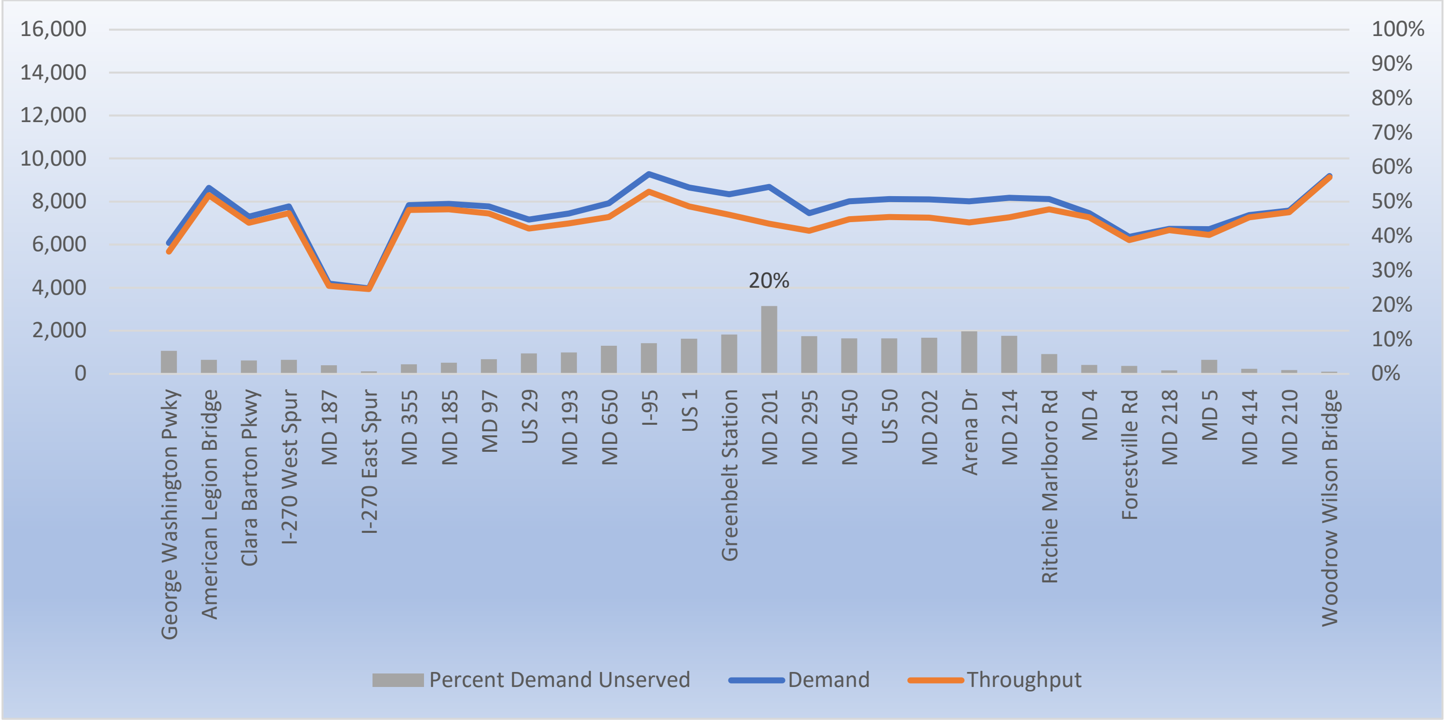


Figure 3-5: I-495 Existing (2017) 4-5 PM Outer Loop Demand vs. Throughput and Percent Demand Unserved



Demand Unserved is the demand that is not met; it is shown as the percent difference between demand and throughput.

Figure 3-6: I-270 Existing (2017) 7-8 AM Southbound Demand vs. Throughput and Percent Demand Unserved

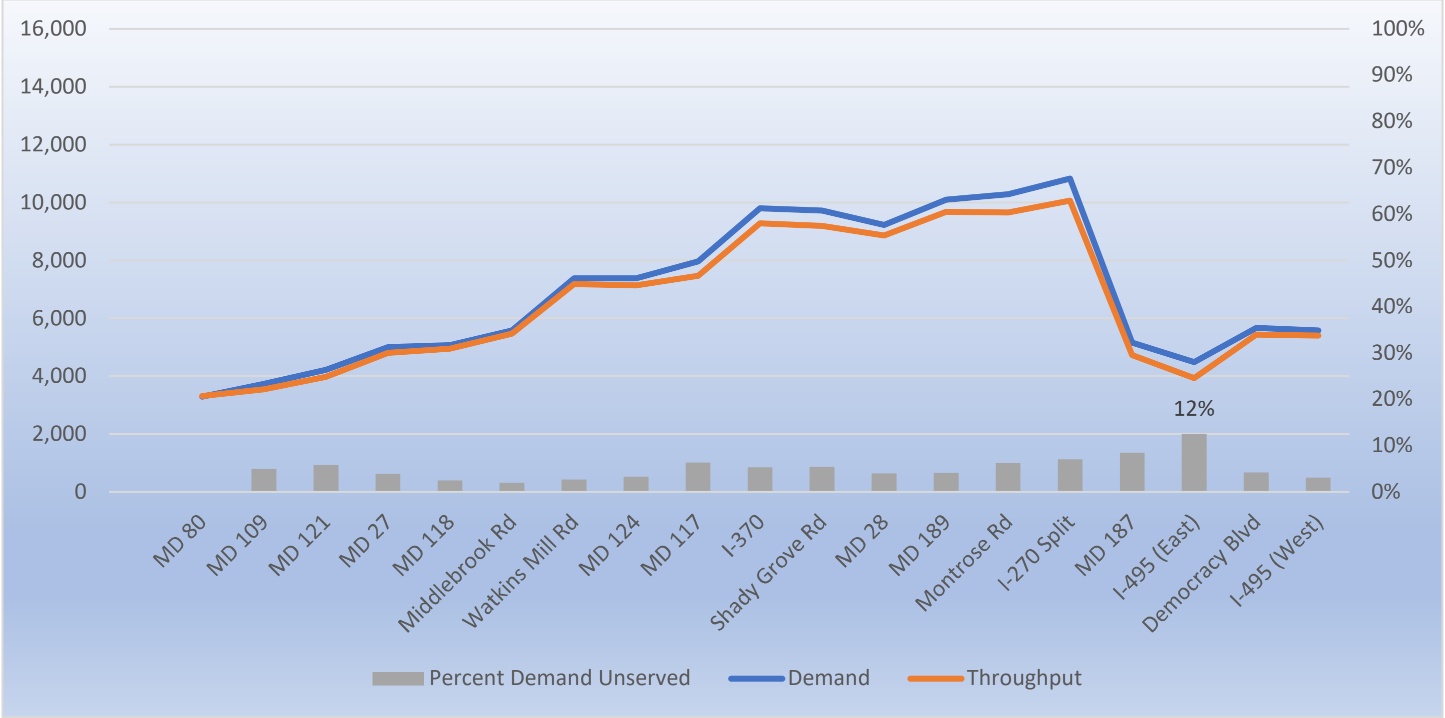
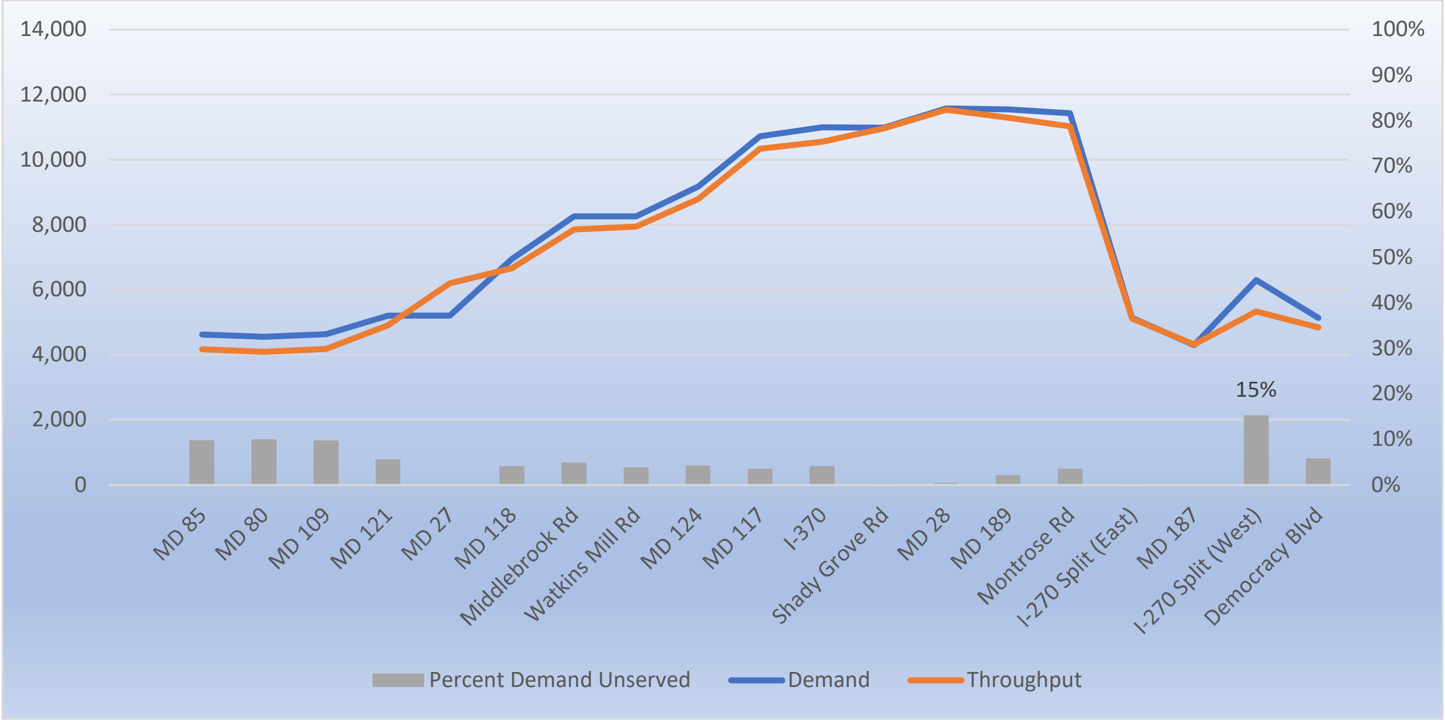


Figure 3-7: I-270 Existing (2017) 4-5 PM Northbound Demand vs. Throughput and Percent Demand Unserved



Demand Unserved is the demand that is not met; it is shown as the percent difference between demand and throughput.

3.4 Freeway Segment and Arterial Intersection Level of Service (LOS)

For intersections, level of service (LOS) is defined in terms of the average total vehicle delay of all movements traveling through an intersection. LOS quantifies several qualitative factors including driver discomfort, frustration, and lost travel time. For segments, LOS criteria are predicted in terms of density or in terms of travel speed as a percentage of free-flow speed. Density refers to the number of vehicles occupying a given length of a roadway. Density is averaged over time and is expressed in passenger cars per mile per lane (pc/mi/ln). Higher density values are indicative of more friction in the system and more congestion. For freeway and arterial segments, the *Highway Capacity Manual (HCM)* assigns LOS grades based on density. Urban freeway segments reach failing (LOS F) conditions when the density exceeds 45 pc/mi/ln.

For intersections, LOS criteria are depicted in terms of average delay per vehicle during a specific time interval. Average vehicle delay is measured based on several variables including signal phasing, signal timing, signal cycle length, and traffic volumes with respect to intersection capacity. Operational conditions for arterial intersections were color-coded to reflect various congestion levels based on delay thresholds established in the *HCM, 6th Edition*. **Figure 3-8** summarizes the thresholds for freeway segments and signalized intersections. Existing LOS along the Study corridors are summarized in the **Figures 3-9 and 3-10**. Speed, density, and LOS for each segment are included in **Appendix H**.

Figure 3-8: HCM Freeway Segment Level of Service (LOS) Thresholds

Figure 3-9: Existing AM Segment Level of Service (LOS)

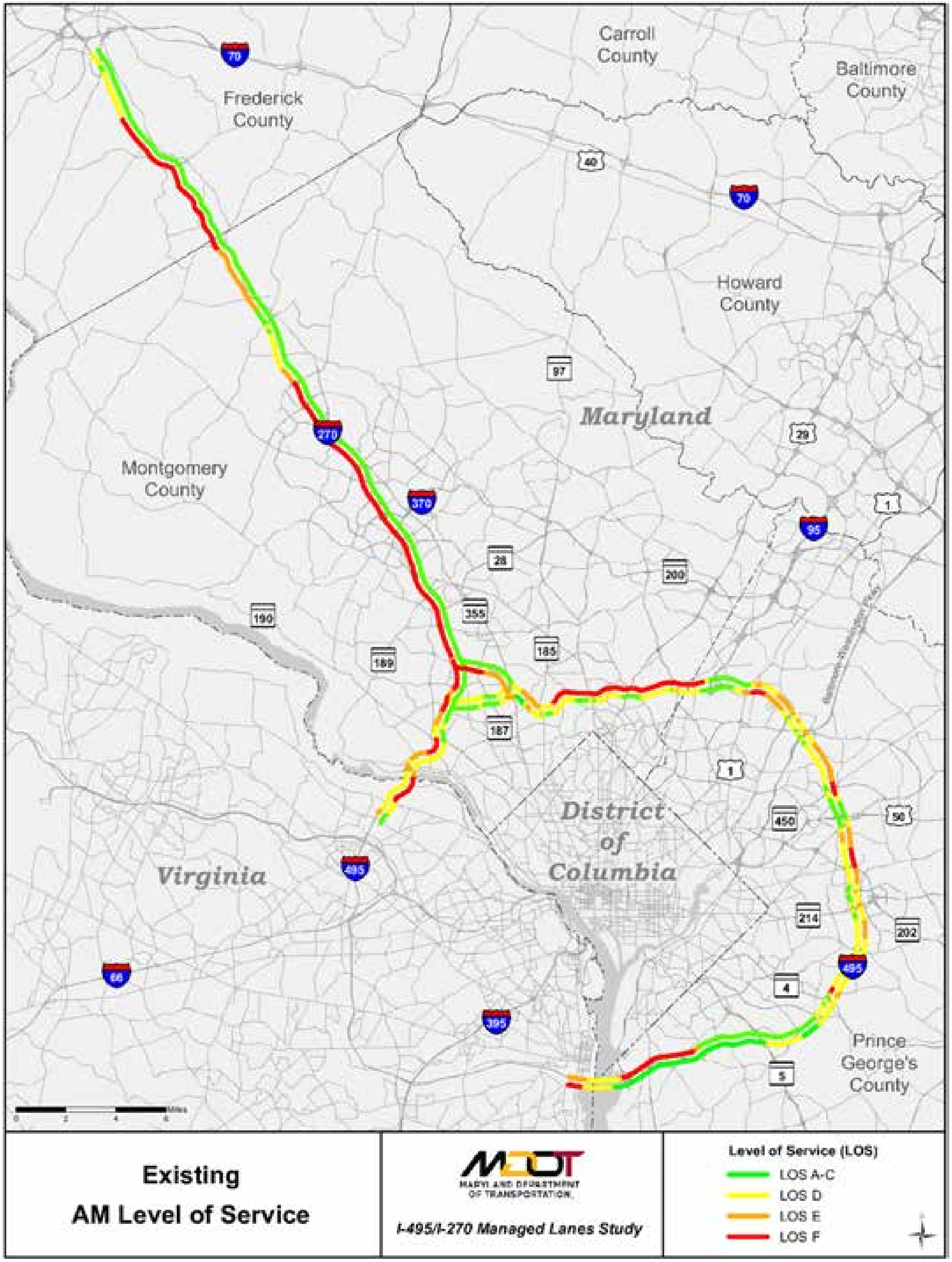
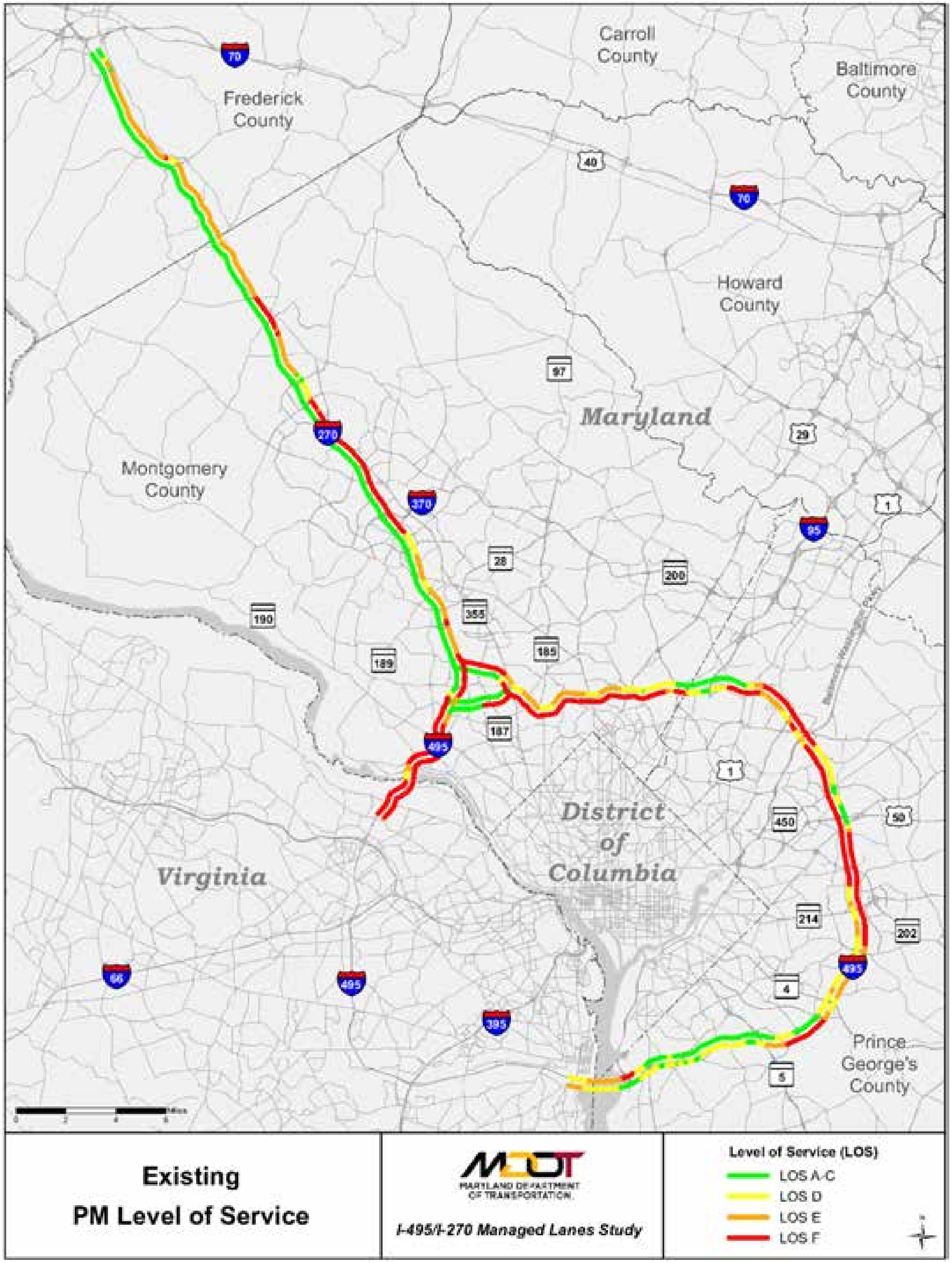


Figure 3-10: Existing PM Segment Level of Service (LOS)



4 DEVELOPMENT OF FUTURE ALTERNATIVE MODELS

The following sections detail the development of future alternative models used to estimate the impacts of future development growth and the Preferred Alternative. As these models are used to compare the Preferred Alternative to No Build conditions, accurate development of the models, including roadway geometry, volumes, speeds, etc., is a critical step in the modeling process.

4.1 Key Assumptions

A. Forecast Development

Two sets of travel demand forecasts were carried out in 2018. The initial round of analyses and high-level evaluations took place prior to July 2018 using the Maryland Statewide Transportation Model (MSTM V 1.092) networks. These evaluations provided high-level demand forecasts and screening of alternatives based upon the facility average daily traffic in each of the potential managed lane corridors (I-270, I-495, and the Baltimore-Washington Parkway). This first round of screening included the modeling of access points at all interchanges with the goal of identifying the locations with the most impactful demand sources and sinks (i.e., locations where vehicles enter and exit the network). This led to the determination that access points could be provided at interchanges, and that slip ramps would not be needed except at termination points. These termination points are:

- The northern end of I-270
- The southern end of I-495 east of the Woodrow Wilson Memorial Bridge
- Near the American Legion Bridge in Maryland and the Dulles Toll Road in Virginia

This round of screening was also used to evaluate the network with and without the HOV lane on I-270.

In late June 2018, the travel forecasting process was changed to the MWCOG Version 2.3.71 Travel Demand Model. The MWCOG Travel Demand Model Region covers 6,800 square miles including 22 counties/jurisdictions in the District of Columbia, Maryland, and Virginia with 3,722 Traffic Analysis Zones. The change was made to be consistent with the parallel travel forecasting carried out by MWCOG in support of the Study's incorporation into the Washington region's *Visualize 2045* – Financially Constrained Long-Range Plan (CLRP), adopted by the MWCOG – Transportation Planning Board (TPB) in 2018, along with additional screening, as well as air quality efforts and traffic and revenue efforts. The V.2.3.71 Travel Demand Model was revised[5] from the V.2.3.70 Model to "better represent dynamically-priced lanes that do not provide preferential treatment to high occupancy vehicles (which are assumed in all of the build alternatives for Maryland's TRP Study)". It also was modified to no longer use the "HOV Skim Replacement" process that required two complete executions of the regional model ("Base" and "Final") to capture variable price tolling. Instead, it only requires a "Final" execution and runs in substantially less time.

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[5] Refer to the June 1, 2018 *Transmittal Information for the COG/TPB Version 2.3.71 Travel Demand Model in Support of Maryland's Traffic Relief Plan (TRP) Study* memorandum from Feng Xie et al. of MWCOG to Carole Delion et al. of MDOT SHA, as well as the December 5, 2018 *User's Guide for the COG/TPB Travel Demand Forecasting Model, Version 2.3.75* in Appendix C for additional information.

The baseline model networks and data provided in the DEIS were the same as the V.2.3.70 Travel Demand Model adopted for the region's Air Quality Conformity Analysis on October 18, 2017 and incorporate Round 9.0 Cooperative Forecasts for the MWCOG Region and the off-cycle amendment to the 2016 Constrained Long Range Plan. All other assumptions including trip rates, tolls, transit fares, and others are consistent with the adopted V.2.3.70 Travel Demand Model.

Following publication of the DEIS, forecasts for the project were updated using a newer version of the MWCOG model, Version 2.3.75. The latest MWCOG modeling assumptions used in the FEIS are described in more detail in **Section 4.3** of this document.

B. Land Use

Land use information used for the travel demand modeling was based on the local jurisdiction/MWCOG long-range plan (i.e., this is not developed or modified by MDOT SHA, which is standard practice). The Study area is highly congested and mostly built out today and will be even more so by 2045. Therefore, the MWCOG model assumes the same land uses in the 2045 No Build model and the 2045 Preferred Alternative model, with no further zoning changes that would result in induced travel.

C. Latent Demand and Induced Demand

The Preferred Alternative forecast accounts for latent demand and induced demand that would be expected as a result of the additional capacity provided. Latent demand (or unserved demand) refers to users that are not currently served by the system but would like to use the system. In this Study, latent demand refers to people who want to use I-495 or I-270 during the peak hours, but do not because of the congestion. Instead, they travel via local roadways or at other times of the day. Induced demand refers to newly generated trips that would not exist without capacity improvements to the transportation network. The MWCOG model was used to model latent and induced demand. The MWCOG model considers route changes, destination changes, and mode changes. Because the Preferred Alternative would decrease travel times along I-495 and I-270, people may be willing to drive a longer distance for their trips as that distance is now within an acceptable travel time. These potential impacts are accounted for in the forecasts. However, as stated in the Land Use section above, the MWCOG model assumes the same land uses in the 2045 No Build model and the Preferred Alternative. Potential future changes to land use policy indirectly related to construction of the Preferred Alternative are unknown at this time and were therefore not included in the modeling assumptions. Under the Preferred Alternative, the new capacity provided is priced to maintain a minimum speed in the Managed Lanes, which will help reduce potential induced demand effects.

D. Background Projects

All future alternatives include all projects in *Visualize 2045*. Background projects along the Study corridors include the I-270 ICM initiative, I-270 at Watkins Mill Road Interchange, the Greenbelt Metro Access improvements along I-495, VDOT Next, MD 97 Montgomery Hill Project, and MD 185 Salt Barn as described in Section 2.2 in this report.

E. Managed Lanes Criteria

This Study includes the evaluation of managed lanes, specifically high-occupancy toll (HOT) lanes on I-495 and I-270 within the limits of Phase 1 South. Descriptions of the HOT lanes included in the Preferred Alternative are provided in Section 1.3 of this report.

It should be noted that toll rates are unknown at this point, but they will be dynamic to manage traffic demand in the HOT lanes. For the purposes of this analysis, volumes in the managed lanes were assigned to provide the maximum throughput while maintaining speeds of at least 45 mph in the managed lanes (the federal requirement). This threshold occurs at 1,600 to 1,700 vehicles per hour per lane in the highest demand segment, which equates to a maximum of 3,200 to 3,400 vehicles per hour in the two-lane managed lane network. The toll rate would be higher for single-occupant vehicles in the HOT managed lanes to offset the transit buses and HOV 3+ vehicles that could use the HOT lanes toll-free to manage the volumes and maintain speeds of at least 45 mph in the management lanes.

F. Managed Lanes Access

As part of the Preferred Alternative, access to and from the managed lanes is proposed via at-grade auxiliary lanes or direct access ramps. The direct access locations have evolved throughout the Study based on input from the stakeholders and design modifications to avoid or minimize impacts to sensitive resources, while still meeting the Purpose and Need. The operational analysis results presented in this FEIS assume direct access would be provided at the following locations, consistent with the latest design for the Preferred Alternative, and shown in **Figure 4-1**:

- Three (3) interchanges on I-495:
  - George Washington Memorial Parkway
  - Cabin John Parkway / MD 190
  - I-270 west spur
- A set of exchange ramps between Maryland and Virginia, including:
  - Outer loop exchange ramp from Maryland high-occupancy toll (HOT) managed lanes to Virginia general purpose lanes south of the ALB
  - Inner loop exchange ramp from Virginia general purpose lanes to Maryland HOT managed lanes south of ALB
- A set of exchange ramps on the West Spur of I-270 providing ingress/egress in both directions
- Five (5) interchanges on I-270:
  - I-495 and I-270 Y-split on the west spur
  - Westlake Terrace (expanded interchange serving all directions)
  - Wooton Parkway (new interchange)
  - Gude Drive (new interchange)
  - I-370 (to/from the south)

Figure 4-1: Assumed Managed Lanes Access Locations

G. Removal of Collector-Distributor Lanes

The existing Collector-Distributor lane system along I-270 from Montrose Road to I-370 would be removed under the Preferred Alternative to minimize the footprint and associated impacts. The removal of the Collector-Distributor lanes eliminates conflict points at the slip ramps and helps to balance volumes evenly across the general-purpose lanes, which improves traffic flow. However, there is some tradeoff as this change causes additional merging and weaving in the general-purpose lanes, which can negatively impact operations. The net result of removing the Collector-Distributor lane system is included in the VISSIM results for the Preferred Alternative, which are presented in Section 5 of this report.

H. Consideration of Automated Vehicles

The expected influx of connected and autonomous vehicles (CAVs) will impact future traffic operations on all roads in Maryland, including I-495 and I-270. MDOT SHA participates in a statewide CAV working group (https://mva.maryland.gov/safety/Pages/MarylandCAV.aspx) to stay up to date on the latest research and industry projections. At this time, there are too many unknowns regarding how CAVs could affect demand and capacity to include CAVs directly in the traffic forecasts. Therefore, the traffic projections for this Study apply traditional forecasting techniques, while being cognizant of the potential CAV impacts. However, it is anticipated that this project will be adaptable to accommodate CAVs because the proposed managed lanes will create a controlled environment with physical separation, new pavement, and clear delineations, features that are conducive to CAV use.

4.2 Forecasting

Three major modeling components (regional travel demand model, VISUM model, VISSIM model) were utilized for future year volume development and traffic operational analysis. As a first step, the regional travel demand model was run, and a subarea extraction process was developed to create inputs for the next step. The corresponding subarea network and origin-destination (O-D) trip tables were extracted and used as the basis for more refined modeling using VISUM. For the second step, a VISUM model was developed to estimate the number of trips entering and exiting the study area. And lastly, the corresponding VISUM traffic volumes were used in the VISSIM model for detailed operational analysis.

The following sections provide an overview of the MWCOG model and VISUM modeling platform, their role and importance to the overall forecasting process, and how the results of these tools were used to help develop the project forecasts. VISSIM analysis results for the 2045 No Build conditions and the Preferred Alternative are presented in Section 5 of this report.

4.3 MWCOG Model Assumptions

Regional travel demand models provide valuable insights and big-picture perspectives, helping to identify areas with anticipated growth, traffic impacts due to network changes and tolling policies, and corridors that will potentially require congestion mitigation. The I-495 and I-270 corridors in Maryland, which fall within MWCOG's region, are the two most heavily traveled freeways in the National Capital Region. To maintain consistency with previous NEPA forecasting efforts, the MWCOG travel demand model was used as the first step of the forecasting process.

The Metropolitan Washington Council of Governments (MWCOG) Travel Demand Forecasting Model, Version 2.3 Travel Model, Build 75 (adopted on October 17, 2018), which reflects the Round 9.1

Cooperative Forecasts as the socioeconomic data, was used as the basis for the development of traffic forecasts for the FEIS. Prior to the use of the model for the DEIS, MWCOG completed a validation of the model (Version 2.3.71) as documented in the Traffic Technical Report (an attachment to the FEIS). Since the updates made to the model in Version 2.3.71 were carried forward into Version 2.3.75, no further validation efforts were made.

Validation is based upon the percent difference between estimated and observed volumes at the screenline level, and between link-level model estimates and observed counts. Link and period level volumes from the MWCOG model were not used directly for volume development. The regional travel demand model was used solely to develop seed information and growth rates for input to the operational analysis.

A. MWCOG Base and Future Year Model Development

The MWCOG model was used as the first step in a two-part process. First, using the provided model, runs were conducted to capture regional behavior and impacts to the project study area for the No Build and Build scenarios. Networks provided with the model were updated to reflect the latest assumptions given the definition of the project. Second, a post processor was developed for the extraction of the subarea to produce input data that reflected necessary details for the VISUM model analyses. The post processor utilized consistent assumptions in the assignment algorithm and convergence criteria as used by the MWCOG model. Results from both the core model and post processor were reviewed to ensure that results of the subarea extraction process reflected traffic assignment and trends of the core model runs.

Due to the magnitude and intricacy of the study area network, network adjustments were made to improve the subarea extraction process and provide consistency with VISUM model details. These network changes included interchange geometry refinements to improve traffic assignment and centroid connector placement for proper trip loading to/from the traffic analysis zones (TAZs) that were within the VISUM model area. Additional turn penalties were implemented to prevent illogical movements on the study corridors. For future year conditions, the same level of detail was included.

For design year modeling, link area types (ATYPE) and related traffic assignment were reviewed in detail to ensure reasonable model results. Based on MWCOG model assumptions, as a TAZ increases in density or is adjacent to a TAZ with a change in future year ATYPE, the resulting number of trips may decrease even when demographic data shows development growth. This can occur when a TAZ becomes a higher area type that has different associated trip rates. Roadway capacities and speeds may also decrease as a result of ATYPE impacts, even when no future year modifications to facilities are anticipated. The underlying premise is that as an area becomes denser, resulting travel patterns will yield higher levels of non-motorized travel (e.g., walking) or other traffic shifts due to this dense environment. To address locations with unlikely negative growth, along with illogical speed and capacity changes within the project area, the base year ATYPE was assumed model wide for the future year scenarios.

Network reviews were conducted to confirm that future committed projects were reflected in the No Build models, as defined by the Constrained Long-Range Plan (CLRP). The Build models were developed by coding in the Recommended Preferred Alternative (RPA), which reflected the latest design configurations, access point assumptions, and expansion of the toll process to account for new links and connections outside of the CLRP assumptions. Tolls were assigned to network links in the MWCOG model using a TOLLGRP attribute. The coding of the TOLLGRP was adjusted to ensure consistent toll rates were applied between each access / egress point along the project corridor. Toll rates were also calibrated to ensure that the volumes on the managed lanes did not degrade the speeds beyond acceptable levels. Details of the toll calibration process are in the following sub-section.

B. Toll Calibration

As part of the development of the 2.4 Version of the MWCOG Model, new parameters were developed by TPB staff for setting the toll rates in the model. A volume-to-capacity ratio (V/C) target of 0.90 to 0.95 was established as the target for the toll search algorithm consistent with a speed of 45 to 55 mph based on the volume delay functions applied in the model (Source: MWCOG Version 2.4 User guide, page 38-39). Consistent with MWCOG procedures related to modeling of projects that include a toll component, the toll rates in the model were evaluated along the project corridor. Considerations for making toll adjustments were based on evaluating each TOLLGRP segment for operating over the minimum speed threshold of 45 mph or for being underutilized with a V/C less than 0.9. If the HOT managed lanes were operating above the minimum speed and below the capacity threshold, and operations in the general purpose lanes were at or over capacity in the peak direction, toll rates were lowered to draw additional traffic into the HOT managed lanes. Conversely, if the HOT managed lanes were over-capacity, the toll rates were increased.

The calibration of toll rates was an iterative process consistent with the methods recommended by MWCOG. The TOLLGRP segments were identified where adjustments were required as described above. A series of assignments were completed to test alternative toll rates during the peak periods. Once a set of toll rates were identified, the overall MWCOG model was rerun to ensure the calibration of the toll rates was still sufficient. The resulting tolls were then used in the post processor assignment process.

C. VISUM Subarea Preparation

As part of the post processor used for the subarea extraction, toll vs non-toll trips were identified in the assignment process. The resulting toll trips for the Build scenario were analyzed using a series of MWCOG origin-destination matrices results. Model results distinguish toll eligible trips from non-toll eligible trips for each of the six vehicle classes. Trips were identified in the post processor that utilized a toll facility as part of their trip and thus were then defined as toll eligible for consideration in the VISUM modeling. Toll eligible trips represent vehicles that are expected to access the managed lanes at some point during their trip, while non-toll eligible trips represent vehicles that are expected to conduct travels solely in general purpose lanes. The assignment process in the MWCOG travel demand modeling accounts for driver-related costs including toll costs, travel time, capacity, distance, and resulting congestion, which are reflected in the origin-destination subarea matrices. After applying the appropriate calibration and growth adjustments as part of the MWCOG modeling process, the MWCOG origin-destination matrices were assigned to the VISUM network.

Through this process, input networks and trip tables were produced for 2017 Existing, 2045 No Build, and 2045 Build Preferred Alternative conditions for the VISUM analysis. Additional details include:

- Subarea networks reflect proper interchange configurations along the study corridors, including directional lanes, turn penalties, and ramp configurations

- Trip tables are provided for four periods (i.e., AM, MID, PM, NT) for six different vehicle classes (i.e., SOV, HOV2, HOV3+, CMV, TRK, AIR)
- Trip tables differentiate "toll eligible trips" for all six classes (i.e., those trips that would use one or more toll facilities for a portion of their trip)

4.4 VISUM Model

A VISUM model (using PTV VISUM 18) was established to produce the daily, morning (6:00 to 10:00 AM), and afternoon (3:00 to 7:00 PM) traffic volumes. This helped to streamline the process of reassigning traffic to the study roadway network at a more detailed and refined level beyond the MWCOG model, which was needed for the VISSIM microscopic operations analysis. The VISUM study area was extended beyond the VISSIM traffic analysis study area to account for potential shifts in traffic between competing roadways. The following sections provide further details regarding the development, calibration, and validation of the VISUM model.

A. VISUM Base Year Model Development

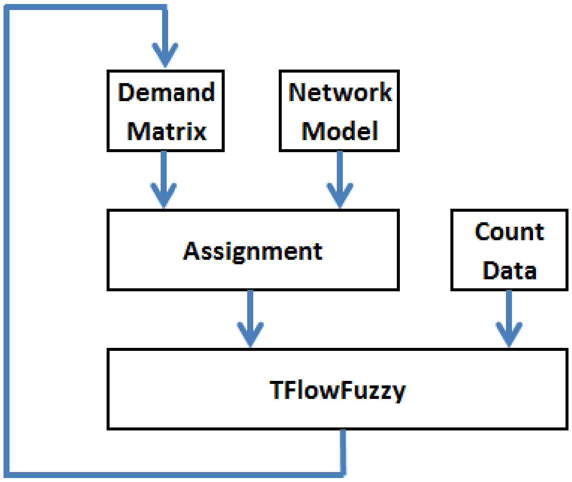
To develop the base year model, the MWCOG model subarea network was imported into VISUM and refined to include the detailed geometry of all roadways and intersections within the study area, including signalized intersections and key unsignalized intersections. Existing signal timing data provided by MDOT SHA was coded into VISUM. Zones that served multiple driveways and developments were further subdivided to achieve a more accurate traffic assignment at the peak hour level. The MWCOG subarea origin-destination (O-D) matrices were exported as AM and PM peak period matrices and used as a seed matrix for the initial VISUM traffic assignment - the starting point of the VISUM model development. The MWCOG matrices were exported to align with the peak hour time periods. The MWCOG matrices were aggregated appropriately for all vehicle classes to produce individual AM and PM peak hour assignments in VISUM.

Model calibration and validation refers to the process that confirms the model provides a reasonable approximation of reality (validation) and makes any adjustments to the model to bring it within desired validation targets (calibration). This ensures that the model accurately represents existing traffic conditions. Existing balanced traffic count data was the primary data used to assess the validity of the VISUM trip assignment. Field data, such as traffic control, signal timing, lane configurations, and travel speeds were used as inputs into the model. All of these factors were taken into consideration to produce a model that reflected realistic conditions and driver tendencies.

VISUM was calibrated to match the existing link and turning movement volumes using its matrix estimation tool, TFlowFuzzy. This built-in procedure adjusts the demand matrix so that its assignment results match balanced traffic counts. The iterative process shown in **Figure 4-2** was used to estimate the peak hour O-D matrices using TFlowFuzzy for the AM and PM peak periods.

For calibration purposes, target values were established using industry standards in order to establish a calibrated model. The three main standards will include RMSE (root-mean-square-error), GEH (Geoffrey E. Havers statistic formula), and R2 values. All three standards measure the differences between the traffic volumes predicted by a model and the traffic volumes that are observed and collected in the field. After calibration efforts are complete, all measures will fall within the acceptable targets.

Figure 4-2: VISUM Trip Assignment Iterative Process



B. VISUM Future Year Model Development

The future year VISUM model was developed to generate AM and PM peak hour forecasts for the 2045 No Build and Preferred Alternative Build conditions. To establish the future year VISUM model, adjustments required for base year calibration were applied to the future year trip tables generated from the MWCOG model. The peak hour correction matrices from the base year validation process were applied to the future year trip tables. For these adjustments, NCHRP 255/765 post processing guidelines were applied at the O-D level. Given the nature of individual O-D pairs within a matrix (e.g., values can be very low and/or base to future year model volume differences can be significant), a straight difference or ratio application was not used. Instead, the modified ratio adjustment method was applied first, followed by additional reviews to ensure individual O-D pair growth was reasonable. This process was repeated for each of the six classes (i.e., SOV, HOV2, HOV3+, TRK, CMV, AIR) and all eight peak hours (i.e., 6 AM – 10 AM and 3 PM – 7 PM). The VISUM model network was modified to reflect future committed projects as defined for the design year to establish the No Build models, while the Build VISUM networks incorporated all related Preferred Alternative details within the project study area.

Following the initial future year VISUM assignment of each peak hour, a series of reviews were conducted, and adjustments were applied to achieve a reasonable level of consistency with other forecasting analyses. Extensive coordination and post processing efforts were carried out to ensure that the future year (2045) forecasts reflected key trends from the regional travel demand model, while also aligning with previous and concurrent forecasting efforts for various locations within the project study area. The resources and related assumptions that were taken into consideration include the following:

- MWCOG Regional Model Trends
- Traffic and Transportation Studies (MDOT SHA Travel Forecasting and Analysis Division)
- I-270/I-495 DEIS Forecasts (NEPA)
- I-495 Project Next Forecasts (VDOT)
- Phase 1 South Developer Forecasts (Accelerate Maryland Partners - AMP)

The following sub-sections highlight some of the key assumptions made and additional post processing efforts that were incorporated into the forecasts.

C. MWCOG Regional Trends

As a first step to the forecasting process, general trend reviews were conducted for the initial forecasted volumes versus MWCOG model volumes to compare growth trends along both mainline and arterial segments. In addition to segment level growth, other checks were performed, including slip ramp utilization, general purpose traffic vs managed lane traffic splits, and K factor checks for ADT volume development. These reviews were conducted to ensure that the preliminary 2045 forecasts for the No Build and Build scenarios accurately reflected regional model trends, traffic diversions, and future year growth before applying additional refinements.

D. MDOT SHA Traffic Analyses & I-270/I-495 DEIS Forecasts

The previous DEIS forecasts incorporated forecasting assumptions from MDOT SHA volume projections and other studies provided by MDOT SHA Travel Forecasting and Analysis Division. The 2040 forecasts developed for the MLS modeling efforts reflected anticipated growth in key areas – in some cases, the amount of growth exceeded estimates from the MWCOG regional model. To better align with these previously established 2040 volume projections, the forecasted growth for the following arterials/interchanges were taken into consideration: Watkins Mill, MD 124, MD 117, Middlebrook Road, MD 118, Greenbelt Metro, MD 201, US 1, and MD 121.

E. Toll Lane Capacity & Phase 1 South Developer Forecasts

After reviewing previous and concurrent forecasting analyses, toll lane capacity assumptions generally ranged from 1500 to 1700 vehicles per hour per lane (veh/hr/ln). During the DEIS forecasting process, a toll lane capacity of 1,700 veh/hr/ln was assumed for the 2040 DEIS forecasts. Additional coordination with the developer (AMP) was conducted to gain a better understanding of key assumptions that were used to develop preliminary design volumes (e.g., design configurations, tolling policies, resulting capture rates, etc.). To better align with these latter assumptions, a toll capacity of 1500 to 1600 veh/hr/ln for the Preferred Alternative Build scenario was ultimately used for the FEIS forecasts.

This threshold toll capacity assumption was established since tolling prices are expected to be adjusted during the peak hours to maintain acceptable operating speeds on the toll lanes. Applying a cost function to represent toll pricing for MWCOG toll eligible trips, toll volume refinements were completed via an iterative process in VISUM to incorporate these toll capacity assumptions. Forecasts were reviewed and adjusted to ensure that traffic projections in the general purpose and toll lanes generally align with MWCOG model trends without exceeding the established toll lane capacity.

F. VDOT I-495 Project NEXT Forecasts

Forecasting efforts for VDOT and MDOT differed in terms of the starting-point (existing conditions volumes) and travel demand models. After coordination between MDOT and VDOT representatives, additional volume adjustments were made to ensure that future year forecasts were within an acceptable margin of error for travel demand forecasting. Extending from the American Legion Bridge (ALB) to just south of VA 193, the FEIS volume forecasts were modified to reach the following goals: (1) 2045 traffic volumes in the vicinity of the ALB were consistent with VDOT 2045 forecasts, within 10 percent of VISSIM throughputs at the ALB, and (2) 2045 traffic volumes align with VDOT 2045 traffic projections along George Washington Memorial Parkway and VA 193, including ramp facilities.

G. Final 2045 Forecasting Review Forecasting Considerations

The overarching goal of the forecasting process was to produce a set of future year forecasts that would accurately depict anticipated utilization of the managed lanes and the impacts to adjacent roadway facilities. As a final step, future year volumes were reviewed and further refined as needed to achieve the best balance between consistency with previously established forecasts (both anticipated traffic volume projections and operations) while maintaining key trends from the MWCOG regional model. These finalized traffic volumes became the basis for VISSIM modeling efforts. Balanced traffic volumes for all future conditions, including No Build and the Preferred Alternative, are included in **Appendix A**.

H. COVID-19 Forecasting Considerations

The COVID-19 global pandemic had a profound impact on the daily routines of people across the world, affecting the way Maryland residents and regional commuters work, travel, and spend their free time. In the short-term, these changes have altered travel demand, transit use, and traffic volumes throughout the years 2020 and 2021 on all roadways in Maryland, including I-495 and I-270. In the long-term there is uncertainty surrounding forecasts for post-pandemic traffic levels and transit use and there is no definitive model to predict how or if changes to mobility patterns during the pandemic will affect long-term traffic projections.

While the 2045 forecasts used for evaluating No Build conditions and the Preferred Alternative were developed using models that were developed and calibrated prior to the onset of the COVID-19 pandemic and do not specifically include potential long-term impacts of the pandemic, MDOT SHA has been closely monitoring the changes in traffic patterns throughout the pandemic. Based upon historic research of other similar dramatic societal effects on travel and the most recent data suggesting that traffic is rebounding close to pre-pandemic levels, the 2045 forecasts used in this FEIS have been determined reasonable for use in evaluating projected 2045 conditions. Additionally, MDOT SHA conducted a sensitivity analysis evaluating several “what if” scenarios, including potential sustained changes in teleworking, eCommerce, and transit use on projected 2045 travel demand and operations. The results of the MWCOG and VISSIM sensitivity analyses confirm that the capacity improvements proposed under the Preferred Alternative would be needed and effective even if future demand changes from the pre-pandemic forecasts based on potential long-term impacts to teleworking, e-commerce, and transit use that are not formally accounted for in the current regional forecasting models. Details of the monitoring efforts, research, and sensitivity analysis are included in the *Final COVID-19 Travel Analysis and Monitoring Plan* in **FEIS, Appendix C**.

5 SUMMARY OF FUTURE CONDITIONS

VISSIM models were developed for 2045 No Build conditions and the Preferred Alternative using the Existing (2017) VISSIM model and applying the future volumes (No Build and Preferred Alternative Build models) and proposed geometry (Alternative 9 – Phase 1 South Build model). The Preferred Alternative was evaluated using the following six key traffic operational metrics:

- System-Wide Delay
- Corridor Travel Time and Speed
- Density and Level of Service (LOS)
- Travel Time Index (TTI)
- Vehicle Throughput
- Effect on Local Roadway Network

The metric of achieving an average speed of 45 mph within the managed lanes is met for the Preferred Alternative. The following sections summarize the performance of the Preferred Alternative compared to 2045 No Build conditions for each metric, as they relate to the Study's Purpose and Need screening criteria. These results supersede the preliminary results presented in the Supplemental Draft Environmental Impact Study (SDEIS) published in October 2021. The updated results account for:

- Design refinements made to the Preferred Alternative following coordination with various stakeholders to further improve operations and/or minimize property and environmental impacts, as described in **FEIS, Chapter 3**

- Updates to the traffic forecasts based on new information obtained by the project team related to background projects, including the VDOT NEXT project and the Greenbelt Metro Interchange project (refer to **Section 2.2** of this document for additional details)

- Refinements to the models to address potential issues and discrepancies in the preliminary results identified during the SDEIS comment period

- More iterative modeling to better capture assumed toll lane demand

5.1 System-Wide Delay

This metric was used to assist in evaluating the criterion of Existing Traffic and Long-Term Traffic Growth. System-wide delay reflects the average amount of time each vehicle in the VISSIM simulation model is delayed while trying to reach its destination. Delay can be caused by slow travel due to congestion or when vehicles must yield right-of-way at a stop-controlled or signalized intersection. System-wide delay is reported in the unit of seconds per vehicle and minutes per vehicle. The results for 2045 No Build conditions and the Preferred Alternative are shown in **Table 5-1** and were generated from the VISSIM outputs. These results include all vehicles in the system for the full simulation period, which included four hours in the morning (6:00 AM to 10:00 AM) and four hours in the afternoon (3:00 PM to 7:00 PM). For the raw delay values, lower numbers are better, reflecting a reduction in congestion. For the percent improvement compared to 2045 No Build conditions, higher numbers are better, reflecting a greater benefit. For this metric, the Preferred Alternative would reduce the average delay per vehicle in the system by approximately 13 percent during the AM peak period and by approximately 38 percent during the PM peak period compared to 2045 No Build conditions.

5.2 Corridor Travel Time and Speed

This metric was also used to assist in the evaluation of the criterion of Existing Traffic and Long-Term Traffic Growth. Corridor travel time represents the amount of time it would take a vehicle to travel from one end of the Study limits to the other along either I-495 or I-270 during the peak hour in the design year of 2045. Similarly, corridor speed represents the average speed during the trip. Results were generated for the I-495 Outer Loop from MD 5 to George Washington Memorial Parkway, the I-495 Inner Loop from George Washington Memorial Parkway to MD 5, I-270 Northbound from I-495 to I-370, and I-270 Southbound from I-370 to I-495. Results were also generated separately for travel in the general purpose lanes and the managed lanes.

The results for 2045 No Build conditions and the Preferred Alternative were generated from the VISSIM outputs and are shown in **Table 5-2A** (Travel Time) and **Table 5-2B** (Speed). Data was compiled for all links in the system in the general purpose lanes and the HOT lanes during the AM peak hour (7:00 AM to 8:00 AM) and the PM peak hour (4:00 PM to 5:00 PM). For travel times, lower numbers are better, reflecting more efficient travel. For speeds, higher numbers are better. More detailed speed and travel time data is provided in **Appendix E**.

The results of the corridor travel time analysis indicated that the Preferred Alternative would be projected to improve travel times along I-495 in both directions during both the AM and the PM peak periods compared to 2045 No Build conditions, but travel times would still be high on the Inner Loop during the PM peak period due to congestion that would form downstream of the Phase 1 South limits within the no action area on the top side of I-495.

The results of the speed analysis indicated that the additional capacity proposed under the Preferred Alternative would provide the option for a free flow trip in the HOT lanes (average speed of 60 mph) and would also provide benefits to the existing lanes by improving average speeds in the GP lanes by 4 miles per hour (mph) on average throughout the study area during the peak periods compared to the No Build condition, from 24 mph to 28 mph.

Detailed corridor travel speed results by peak hour and direction for the GP lanes and the managed lanes are provided in **Table 5-2B**. During the 2045 AM peak, speeds in the I-495 GP lanes are projected to improve under the Preferred Alternative compared to No Build and all HOT lanes are projected to maintain speeds of at least 60 mph. On the I-495 outer loop, average speeds in the GP lanes are projected to improve from 35 mph to 50 mph between the I-270 west spur and the George Washington Memorial Parkway and improve slightly (from 20 mph to 22 mph) in the no action area between MD 5 and the I-270 West Spur. On the I-495 inner loop, average speeds in the GP lanes are projected to improve from 38 mph to 55 mph between the George Washington Memorial Parkway and the I-270 west spur and remain unchanged (at 26 mph) in the no action area between MD 5 and the I-270 west spur. On I-270 southbound, average speeds in the GP lanes are projected to improve slightly (from 44 mph to 45 mph) between I-370 and I-495 compared to No Build conditions, and motorists would have the option of a free flow trip (62 mph) in the adjacent HOT lanes. On I-270 northbound, speeds are free flow during the AM peak period under both the No Build and the Preferred Alternative. The results show a slight improvement in average speed along I-270 northbound under the Preferred Alternative compared to No Build (from 55 mph to 61 mph) due to the removal of the Local Lanes system and the provision of the adjacent HOT lanes (which are projected to operate at 63 mph).

During the 2045 PM peak, the Preferred Alternative is projected to improve speeds significantly along the I-495 outer loop in the GP lanes throughout the study area. Average speeds in the GP lanes are projected to improve from 22 mph to 52 mph between the I-270 west spur and the George Washington Memorial Parkway and from 19 mph to 32 mph in the no action area between MD 5 and the I-270 west spur due to the Preferred Alternative relieving the downstream bottleneck. The HOT lanes along the I-495 outer loop are projected to operate at free flow conditions (63 mph) during the PM peak.

Speeds along the I-495 inner loop and I-270 northbound are limited by downstream congestion outside the limits of Phase 1 South during the PM peak under the Preferred Alternative (i.e. along the inner loop from the I-270 east spur toward I-95 and the B/W Parkway). On the I-495 inner loop, average speeds in the GP lanes are projected to improve slightly (increase from 14 mph to 15 mph) between the George Washington Memorial Parkway and the I-270 west spur under the Preferred Alternative during the 2045 PM peak hour compared to the No Build Alternative but speeds remain low because of severe congestion that will remain on the top side of I-495 in the no action area. Average speeds in the HOT lanes will maintain free flow operations (62 mph) until they merge back into the GP lanes east of the I-270 west spur. In the no action area between the I-270 west spur and MD 5, I-495 inner loop speeds will drop slightly between the No Build and Preferred Alternative, from 25 mph to 24 mph, due to the additional demand served during the peak hour.

On I-270 northbound, average speeds in the GP lanes would be similar for the Preferred Alternative compared to the No Build Alternative (27 mph) in the 2045 PM peak without additional improvements on I-270 north of I-370 because of severe congestion where I-270 reduces to two lanes north of the Phase 1 South limits. Average speeds in the HOT lanes would be better and motorists would achieve the desired average speed of 45 mph until they merge back into the GP lanes north of I-370. Potential improvements in the section of I-270 north of I-370 are being evaluated under a separate pre-NEPA study. On I-270 southbound, projected speeds are generally free flow during the PM peak period because this is the off-peak direction. Average speeds are projected to be similar for the Preferred Alternative compared to the No Build and Preferred Alternative (increase slightly from 57 mph to 58 mph), with higher average speeds (63 mph) in the adjacent HOT lanes.

5.3 Density and Level of Service (LOS)

This metric was used to assist in the evaluation of the criterion of Existing Traffic and Long-Term Traffic Growth. Density is the number of vehicles occupying a given length of a roadway at a particular instant. Density is averaged over time and is expressed in passenger car equivalents per mile per lane (pc/mi/ln). Higher density values are indicative of more friction in the system and more congestion. Level of Service (LOS) is a letter grade assigned to a section of roadway that measures the quality of traffic flow, ranging from LOS A to LOS F. LOS A represents optimal, free-flow conditions, while LOS F represents failing conditions where demand exceeds capacity. For freeway segments, the Highway Capacity Manual assigns LOS grades based on density. Urban freeway segments reach failing (LOS F) conditions when the density exceeds 45 pc/mi/ln.

For this metric, the percentage of lane-miles operating at LOS F was calculated within the Study limits during the AM and PM peak hours. The results are shown in **Table 5-3** and were generated from the VISSIM outputs. Lower percentages are better, reflecting fewer failing roadway segments. The results indicated that the Preferred Alternative would be projected to have a lower number of failing lane miles during both the AM peak hour (7:00 AM to 8:00 AM) and the PM peak hour (4:00 PM to 5:00 PM) compared to 2045 No Build conditions, but that 28 percent of the lane miles would be projected to continue to operate at LOS F in the design year of 2045, primarily in the no action areas along I-495.

Full details of the level of service and density for every link in the Study area are shown in **Appendix H**. A review of the results indicates the following trends:

- Density and LOS are generally improved within the Phase 1 South limits where capacity improvements are proposed under the Preferred Alternative, as expected.
- Outside of the Phase 1 South limits, results are similar between the No Build and Build condition because the Preferred Alternative does not include any geometric improvements in that area. However, the results are not identical because the Preferred Alternative influences demand and throughput on I-495 and I-270 outside of the immediate project footprint. For example:
    - On the I-495 Outer Loop, operations improve on the top side approaching I-270 under Build conditions because downstream congestion is relieved under the Preferred Alternative. Under the No Build Alternative, queues along the I-495 Outer Loop approaching the American Legion Bridge are projected to back up towards I-95 during the peak periods.
    - On the I-495 Outer Loop near MD 4 and US 50, the projected LOS is better under the Preferred Alternative compared to the No Build Alternative during the PM peak period. This is because the forecasted traffic demand volumes are approximately 2 percent lower in this area under Build conditions. Under the Preferred Alternative, congestion is relieved across the American Legion Bridge, and therefore long-distance trips from Virginia to points north are more likely to use the west side of I-495 than under No Build conditions, which reduces demand on the east side of I-495.
    - On the I-495 Inner Loop, projected operations worsen slightly in certain segments outside of the Phase 1 South limits due to additional throughput during the peak hours. Under No Build conditions, traffic is stuck in Virginia behind the major bottleneck at the American Legion Bridge. The Preferred Alternative relieves this bottleneck, which is beneficial for the overall system. However, a byproduct of this is additional pockets of congestion on the Inner Loop near MD 185, MD 187, and MD 214. Other alternatives were studied that would have addressed this issue (including Alternative 9 and Alternative 10) but they were deemed too impactful to be selected as the Preferred Alternative.

5.4 Travel Time Index (TTI)

While corridor travel time and speed provide one way to compare alternatives, few vehicles will travel from one end to the other during their trip, particularly along I-495. Therefore, the metric of TTI was also evaluated along shorter trip segments. This metric was used to assist in the evaluation of the criterion of

Trip Reliability. TTI is a metric used by MDOT SHA to quantify congestion levels on highways and expressways. It is defined as the average (50th percentile) travel time on a segment of highway/ expressway for a particular hour compared to the travel time of the same trip during free-flow or uncongested conditions. The higher the TTI, the longer the travel times. For example, a TTI of 2.0 indicates that a trip that would normally take 15 minutes in light traffic would take 30 minutes in the peak hour due to congestion. The TTI also serves as a proxy for assessing reliability. While the Planning Time Index (PTI) is traditionally used as a measure for reliability, the PTI cannot be directly calculated for future travel times. However, there is a strong correlation between TTI and PTI values. The TTI represents the 50th percentile travel time, while the PTI represents the 95th percentile travel time. TTI values were calculated for the general purpose lanes for eight total highway segments, including four segments in each direction: I-495 from George Washington Memorial Parkway to I-270, I-495 from I-270 to I-95, I-495 from I-95 to MD 5, and I-270 from I-495 to I-370. The results for 2045 No Build conditions and the Preferred Alternative are shown in **Table 5-4** and were generated from the VISSIM outputs. These results include the TTI values for the entire study area (including the no action areas) in the GP lanes for the Preferred Alternative and the No Build Alternative during the AM peak hour (7:00 AM to 8:00 AM) and the PM peak hour (4:00 PM to 5:00 PM) in the design year of 2045. MDOT SHA defines various levels of congestion in four categories based on TTI as follows:

- Uncongested (TTI < 1.15)
- Moderate Congestion (1.15 < TTI < 1.3)
- Heavy Congestion (1.3 < TTI < 2.0)
- Severe Congestion (TTI > 2.0)

The results indicated that the Preferred Alternative would be projected to improve four general purpose segments from congested levels under the No Build Alternative (TTI over 1.15) to uncongested (TTI under 1.15) and also improve two general purpose segments from severe congestion (TTI over 2.0) to heavy congestion (TTI under 2.0) due to the capacity improvements under Build conditions. One general purpose segment would be projected to experience a slight increase in TTI (from 3.8 to 4.0) during the PM peak due to the higher volume served in the segment during the peak hour resulting from the Preferred Alternative releasing the bottleneck at the American Legion Bridge.

Overall, the Preferred Alternative would outperform the No Build Alternative in the metric of TTI with an average TTI value in the general purpose lanes of 1.8 compared to 2.0, with the average TTI improving from the “severe congestion” category under No Build conditions to “heavy congestion” under the Preferred Alternative in the design year of 2045. All HOT lanes would be projected to operate at uncongested levels (TTI < 1.15) under the Preferred Alternative.

5.5 Vehicle Throughput

This metric was used to assist in the evaluation of the criterion of Movement of Goods and Services. Throughput represents the number of vehicles and/or people that pass by a given point in the roadway network in a set amount of time. Throughput quantifies the efficiency of the roadway network in getting people, goods, and services to their destinations. Benefits of increased throughput on the highway include reduced peak spreading (i.e., less congestion in the off-peak hours) and reduced burden on the surrounding roadway network.

The combined vehicle throughput results generated from the VISSIM outputs for the general purpose lanes and the managed lanes, are shown in **Table 5-5**. Results are reported for the AM peak hour (7:00 AM to 8:00 AM) and the PM peak hour (4:00 PM to 5:00 PM). While the VISSIM model can calculate the vehicle throughput at every single location in the model, this evaluation focused on throughput at four key, representative locations throughout the study network: I-495 at the American Legion Bridge, I-495 west of I-95, I-495 at MD 5, and I-270 at Montrose Road. These locations were selected because they cover the four main segments of the Study corridors, separated by major freeway junctions and are therefore representative of the Study corridors as a whole. Results are reported in terms of percent increase in vehicle-throughput for the Preferred Alternative compared to 2045 No Build conditions, rounded to the nearest five percent. Tables showing the travel demand for each segment and time period are included in **Appendix F**. A comparison of throughput and percent demand met for each segment and time period is provided in **Appendix G**.

The Preferred Alternative would add capacity along I-270 and along the west side of I-495 via two HOT managed lanes but would provide no improvements on I-495 east of the I-270 west spur. The results of the throughput analysis indicated that there is a correlation between increased capacity and increased throughput. The Preferred Alternative would increase throughput across the American Legion Bridge by 25 percent during the AM peak and by 30 percent during the PM peak compared to 2045 No Build conditions. On I-270, the Preferred Alternative would increase throughput by 10 percent during the AM peak and by 15 percent during the PM peak compared to 2045 No Build conditions. On I-495 west of I-95 and at MD 5, where no action is proposed, throughput would increase minimally or remain the same during the peak hours compared to 2045 No Build conditions.

Overall, the Preferred Alternative would outperform the No Build Alternative in the metric of vehicle throughput with an average value of 17,700 vehicles per hour at the four key locations compared to 15,700 vehicles per hour under No Build conditions in design year 2045, despite only providing capacity improvements in two of the four locations.

5.6 Effect on Local Roadway Network

This metric was used to assist in the evaluation of the criterion of Movement of Goods and Services. While the focus of the Study is to provide benefits to travelers using I-495 and I-270, the Study would also have impacts on the surrounding local roadway network. This impact was quantified to assist in the evaluation of the Preferred Alternative by calculating the projected reduction in delay on the local road network. The results are shown in **Table 5-6** and were generated from the MWCOG regional model outputs. Values are presented in terms of total vehicle hours of delay each day on all arterials in Montgomery County, Maryland; Prince George's County, Maryland; and the District of Columbia. Other regions in Maryland and Virginia showed negligible change in local delay. Lower values are better, representing less delay for local travelers. **Table 5-6** also shows the percent reduction in delay versus 2045 No Build conditions. Higher values of the percent reduction in delay are better, reflecting greater benefit.

The results indicated that the Preferred Alternative would be expected to reduce delay on the arterials in Montgomery and Prince George's counties and the District of Columbia compared to 2045 No Build conditions by approximately 3.5 percent. The largest benefit would be felt in Montgomery County, where the capacity improvements along I-495 and I-270 are proposed, but some benefits would also be experienced in Prince George's County and the District of Columbia.

Table 5-1: Summary of System-Wide Delay Results from VISSIM Model

CRITERIA	PEAK PERIOD	METRIC	EXISTING	2045 Alternative	
				No Build	Preferred
Accommodate Long-Term Traffic Growth	AM Peak Period (6-10AM)	Average Delay (sec/veh)	267	734	635
		Average Delay (min/veh)	4.5	12.2	10.6
		Percent Improvement vs. No Build	**N/A**	**N/A**	**13%**
	PM Peak Period (3-7PM)	Average Delay (sec/veh)	240	675	419
		Average Delay (min/veh)	4.0	11.3	7.0
		Percent Improvement vs. No Build	**N/A**	**N/A**	**38%**

Legend: Green ≥ 30%; Yellow 20-30%; Orange 10-20%; Red < 10%

Table 5-2A: Summary of Corridor Travel Time Results from VISSIM Model

CRITERIA	METRIC	PEAK PERIOD	CORRIDOR	TRAVEL LANES	EXISTING	2045 Alternative	
						No Build[2]	Preferred
Accommodate Long-Term Traffic Growth	Average Travel Time (minutes)	AM Peak Hour (7-8AM)	I-270 Northbound from I-495 to I-370	General Purpose	9	10	9
				HOT Lanes	N/A	N/A	8
			I-270 Southbound from I-370 to I-495	General Purpose	29	13	12
				HOT Lanes	N/A	N/A	8
			I-495 Outer Loop from I-270 West Spur to George Washington Memorial Parkway	GP Lanes	7	9	6
				HOT Lanes	N/A	N/A	5
			I-495 Inner Loop from George Washington Memorial Parkway to I-270 West Spur	GP Lanes	8	9	6
				HOT Lanes	N/A	N/A	5
			I-495 Outer Loop from MD 5 to I-270 West Spur[1]	GP Lanes	58	101	90
				HOT Lanes	N/A	N/A	N/A
			I-495 Inner Loop from I-270 West Spur to MD 5[1]	GP Lanes	36	76	76
				HOT Lanes	N/A	N/A	N/A
		PM Peak Hour (4-5PM)	I-270 Northbound from I-495 to I-370	General Purpose	15	20	20
				HOT Lanes	N/A	N/A	12
			I-270 Southbound from I-370 to I-495	General Purpose	11	10	10
				HOT Lanes	N/A	N/A	8
			I-495 Outer Loop from I-270 West Spur to George Washington Memorial Parkway	GP Lanes	17	15	6
				HOT Lanes	N/A	N/A	5
			I-495 Inner Loop from George Washington Memorial Parkway to I-270 West Spur	GP Lanes	21	22	21
				HOT Lanes	N/A	N/A	5
			I-495 Outer Loop from MD 5 to I-270 West Spur[1]	GP Lanes	60	105	63
				HOT Lanes	N/A	N/A	N/A
			I-495 Inner Loop from I-270 West Spur to MD 5[1]	GP Lanes	68	81	82
				HOT Lanes	N/A	N/A	N/A

Notes: [1] Shaded rows reflect locations outside the Phase 1 South limits with no action proposed under the Preferred Alternative. [2] No Build results along I-270 are shown as an average of the Express Lanes and the adjacent Local Lanes. Under No Build conditions, vehicles enter and exit I-270 via a separated Local Lanes system, which will be eliminated under the Build alternatives to reduce the roadway footprint and minimize impacts.

Table 5-2B: Summary of Corridor Travel Speed Results from VISSIM Model

CRITERIA	METRIC	PEAK PERIOD	CORRIDOR	TRAVEL LANES	EXISTING	2045 Alternative	
						No Build[2]	Preferred
Accommodate Long-Term Traffic Growth	Average Speed (mph)	AM Peak Hour (7-8AM)	I-270 Northbound from I-495 to I-370	General Purpose	63	55	61
				HOT Lanes	N/A	N/A	63
			I-270 Southbound from I-370 to I-495	General Purpose	21	44	45
				HOT Lanes	N/A	N/A	62
			I-495 Outer Loop from I-270 West Spur to George Washington Memorial Parkway	GP Lanes	46	35	50
				HOT Lanes	N/A	N/A	62
			I-495 Inner Loop from George Washington Memorial Parkway to I-270 West Spur	GP Lanes	40	38	55
				HOT Lanes	N/A	N/A	63
			I-495 Outer Loop from MD 5 to I-270 West Spur[1]	GP Lanes	35	20	22
				HOT Lanes	N/A	N/A	N/A
			I-495 Inner Loop from I-270 West Spur to MD 5[1]	GP Lanes	56	26	26
				HOT Lanes	N/A	N/A	N/A
		PM Peak Hour (4-5PM)	I-270 Northbound from I-495 to I-370	General Purpose	36	27	27
				HOT Lanes	N/A	N/A	45
			I-270 Southbound from I-370 to I-495	General Purpose	54	57	58
				HOT Lanes	N/A	N/A	63
			I-495 Outer Loop from I-270 West Spur to George Washington Memorial Parkway	GP Lanes	19	22	52
				HOT Lanes	N/A	N/A	63
			I-495 Inner Loop from George Washington Memorial Parkway to I-270 West Spur	GP Lanes	15	14	15
				HOT Lanes	N/A	N/A	62
			I-495 Outer Loop from MD 5 to I-270 West Spur[1]	GP Lanes	34	19	32
				HOT Lanes	N/A	N/A	N/A
			I-495 Inner Loop from I-270 West Spur to MD 5[1]	GP Lanes	29	25	24
				HOT Lanes	N/A	N/A	N/A
		Weighted Average Speed		**General Purpose**	**36**	**24**	**28**
				HOT Lanes	**N/A**	**N/A**	**60**

Legend: Green ≥ 40 mph; Yellow 35-40 mph; Orange 25-35 mph; Red < 25 mph

Notes: [1] Shaded rows reflect locations outside the Phase 1 South limits with no action proposed under the Preferred Alternative. [2] No Build results along I-270 are shown as an average of the Express Lanes and the adjacent Local Lanes. Under No Build conditions, vehicles enter and exit I-270 via a separated Local Lanes system, which will be eliminated under the Build alternatives to reduce the roadway footprint and minimize impacts.

Table 5-3: Summary of Density and Level of Service (LOS) Results from VISSIM Model

CRITERIA	PEAK PERIOD	METRIC	EXISTING	2045 Alternative	
				No Build	Preferred
Accommodate Long-Term Traffic Growth	AM Peak Hour (7-8AM)	Total Lane-Miles	465	469	507
		Lane-Miles Operating at LOS F based on Density*	100	148	131
		Percent of Lane-Miles Operating at LOS F based on Density*	22%	32%	26%
	PM Peak Hour (4-5PM)	Total Lane-Miles	465	469	507
		Lane-Miles Operating at LOS F based on Density*	177	222	150
		Percent of Lane-Miles Operating at LOS F based on Density*	38%	47%	30%
	Average Percent of Lane-Miles Operating at LOS F based on Density*		**30%**	**40%**	**28%**

* LOS F is reached at a density of 45.0 passenger cars per mile per lane (pc/mi/ln)

Legend: Green < 15%; Yellow 15-25%; Orange 25-35%; Red ≥ 35%

Table 5-4: Summary of Travel Time Index (TTI) Results for General Purpose (GP) Lanes from VISSIM Model

CRITERIA	METRIC	PEAK PERIOD	CORRIDOR	EXISTING	2045 Alternative	
					No Build	Preferred
Provide a Reliable Travel Time	Travel Time Index (TTI)* in General Purpose (GP) Lanes**	AM Peak Hour (7-8AM)	I-495 Inner Loop from Virginia 193 to I-270	1.4	1.4	1.0
			I-495 Outer Loop from I-270 to Virginia 193	1.2	1.5	1.1
			I-495 Inner Loop from I-270 to I-95	1.0	1.0	1.1
			I-495 Outer Loop from I-95 to I-270	2.8	2.9	2.7
			I-495 Inner Loop from I-95 to MD 5	1.0	2.7	2.6
			I-495 Outer Loop from MD 5 to I-95	1.2	2.5	2.5
			I-270 Northbound from I-495 to I-370	1.0	1.1	1.0
			I-270 Southbound from I-370 to I-495	2.6	1.3	1.2
		PM Peak Hour (4-5PM)	I-495 Inner Loop from Virginia 193 to I-270	3.7	3.8	4.0
			I-495 Outer Loop from I-270 to Virginia 193	2.8	2.4	1.0
			I-495 Inner Loop from I-270 to I-95	2.7	2.8	2.4
			I-495 Outer Loop from I-95 to I-270	1.1	1.8	1.1
			I-495 Inner Loop from I-95 to MD 5	1.5	1.4	1.5
			I-495 Outer Loop from MD 5 to I-95	1.9	2.7	1.9
			I-270 Northbound from I-495 to I-370	1.5	2.2	1.7
			I-270 Southbound from I-370 to I-495	1.0	1.0	1.0
		Overall Average Travel Time Index (TTI)* in General Purpose (GP) Lanes**		**1.8**	**2.0**	**1.8**

* Note: MDOT SHA defines various levels of congestion based on TTI: Uncongested (green) – TTI ≤ 1.15; Moderate Congestion (yellow) – 1.15 < TTI ≤ 1.3; Heavy Congestion (orange) – 1.3 < TTI < 2.0; and, Severe Congestion (red) – TTI ≥ 2.0.

**Note: This table summarizes TTI in the GP lanes. All HOT/Express Toll Lanes would have TTI values in the uncongested range (TTI less than 1.15).

Table 5-5: Summary of Vehicle-Throughput Results from VISSIM Model

CRITERIA	METRIC	PEAK PERIOD	LOCATION	EXISTING	2045 Alternative	
					No Build	Preferred
Improve Movement of Goods and Services	Vehicle-Throughput (veh/hr)	AM Peak Hour (7-8AM)	I-495 at American Legion Bridge	17,105	18,204	22,346
			I-495 west of I-95	14,591	14,381	14,525
			I-495 at MD 5	12,377	8,847	8,990
			I-270 at Montrose Rd	16,225	18,182	19,855
		PM Peak Hour (4-5PM)	I-495 at American Legion Bridge	16,299	17,002	22,472
			I-495 west of I-95	15,561	15,881	16,639
			I-495 at MD 5	13,609	13,804	14,324
			I-270 at Montrose Rd	18,375	19,246	22,182
		Average Vehicle-Throughput (veh/hr)		**15,500**	**15,700**	**17,700**
	Percent Change in Vehicle-Throughput vs. 2045 No Build	AM Peak Hour (7-8AM)	I-495 at American Legion Bridge	N/A	0%	25%
			I-495 west of I-95	N/A	0%	0%
			I-495 at MD 5	N/A	0%	0%
			I-270 at Montrose Rd	N/A	0%	10%
		PM Peak Hour (4-5PM)	I-495 at American Legion Bridge	N/A	0%	30%
			I-495 west of I-95	N/A	0%	5%
			I-495 at MD 5	N/A	0%	5%
			I-270 at Montrose Rd	N/A	0%	15%

Legend: Green ≥ 19,000 veh/hr; Yellow 18,000-19,000 veh/hr; Orange 17,000-18,000 veh/hr; Red < 17,000 veh/hr

Table 5-6: Summary of the Effects on the Local Roadway Network from MWCOG Model

CRITERIA	PERIOD	METRIC	EXISTING	2045 Alternative	
				No Build	**Preferred**
Improve Movement of Goods and Services	Daily	Daily Delay (vehicle-hours) for All Arterials in Montgomery County*	144,028	242,408	230,882
		Percent Reduction vs. No Build (Montgomery County)	**N/A**	0%	4.8%
		Daily Delay (vehicle-hours) for All Arterials in Prince George's County*	98,421	160,143	157,832
		Percent Reduction vs. No Build (Prince George's County)	**N/A**	0%	1.4%
		Daily Delay (vehicle-hours) for All Arterials in District of Columbia (DC)	105,257	176,612	169,859
		Percent Reduction vs. No Build (District of Columbia)	**N/A**	0%	3.8%
		Total Daily Delay (vehicle-hours) for All Arterials in Montgomery County, Prince George's County, and District of Columbia (DC)	347,706	579,163	558,573
		Percent Reduction vs. No Build (Total)	**N/A**	**0%**	**3.5%**

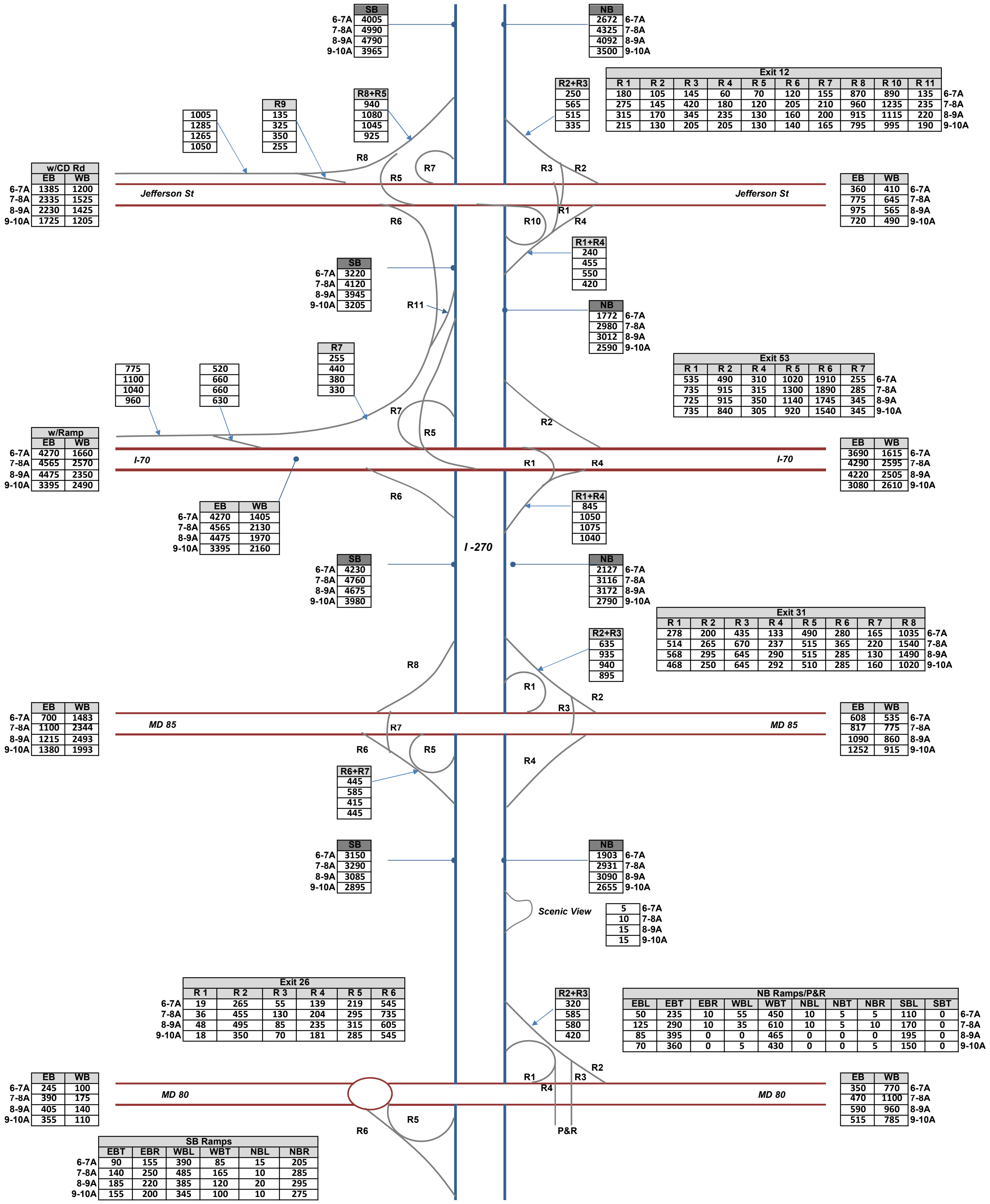
* Note: All other Counties in Maryland and Virginia are expected to experience negligible changes in daily delay.

Legend: Green ≥ 5%; Yellow 0-5%; Red 0%

APPENDIX A:

Existing and Future Traffic Volumes

I-270 & I-495 West Side AM
Existing Peak Period Volumes



	SB
6-7A	4005
7-8A	4990
8-9A	4790
9-10A	3965

NB	
2672	6-7A
4325	7-8A
4092	8-9A
3500	9-10A

Exit 12										
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 10	R 11	
180	105	145	60	70	120	155	870	890	135	6-7A
275	145	420	180	120	205	210	960	1235	235	7-8A
315	170	345	235	130	160	200	915	1115	220	8-9A
215	130	205	205	130	140	165	795	995	190	9-10A

R2+R3
250
565
515
335

R8+R5
940
1080
1045
925

R9
135
325
350
255

1005
1285
1265
1050

	w/CD Rd	
	EB	WB
6-7A	1385	1200
7-8A	2335	1525
8-9A	2230	1425
9-10A	1725	1205

EB	WB	
360	410	6-7A
775	645	7-8A
975	565	8-9A
720	490	9-10A

R1+R4
240
455
550
420

	SB
6-7A	3220
7-8A	4120
8-9A	3945
9-10A	3205

NB	
1772	6-7A
2980	7-8A
3012	8-9A
2590	9-10A

Exit 53						
R 1	R 2	R 4	R 5	R 6	R 7	
535	490	310	1020	1910	255	6-7A
735	915	315	1300	1890	285	7-8A
725	915	350	1140	1745	345	8-9A
735	840	305	920	1540	345	9-10A

775
1100
1040
960

520
660
660
630

R7
255
440
380
330

	w/Ramp	
	EB	WB
6-7A	4270	1660
7-8A	4565	2570
8-9A	4475	2350
9-10A	3395	2490

EB	WB	
3690	1615	6-7A
4290	2595	7-8A
4220	2505	8-9A
3080	2610	9-10A

	EB	WB
6-7A	4270	1405
7-8A	4565	2130
8-9A	4475	1970
9-10A	3395	2160

R1+R4
845
1050
1075
1040

	SB
6-7A	4230
7-8A	4760
8-9A	4675
9-10A	3980

NB	
2127	6-7A
3116	7-8A
3172	8-9A
2790	9-10A

Exit 31								
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	
278	200	435	133	490	280	165	1035	6-7A
514	265	670	237	515	365	220	1540	7-8A
568	295	645	290	515	285	130	1490	8-9A
468	250	645	292	510	285	160	1020	9-10A

R2+R3
635
935
940
895

	EB	WB
6-7A	700	1483
7-8A	1100	2344
8-9A	1215	2493
9-10A	1380	1993

EB	WB	
608	535	6-7A
817	775	7-8A
1090	860	8-9A
1252	915	9-10A

R6+R7
445
585
415
445

	SB
6-7A	3150
7-8A	3290
8-9A	3085
9-10A	2895

NB	
1903	6-7A
2931	7-8A
3090	8-9A
2655	9-10A

5	6-7A
10	7-8A
15	8-9A
15	9-10A

	Exit 26					
	R 1	R 2	R 3	R 4	R 5	R 6
6-7A	19	265	55	139	219	545
7-8A	36	455	130	204	295	735
8-9A	48	495	85	235	315	605
9-10A	18	350	70	181	285	545

R2+R3
320
585
580
420

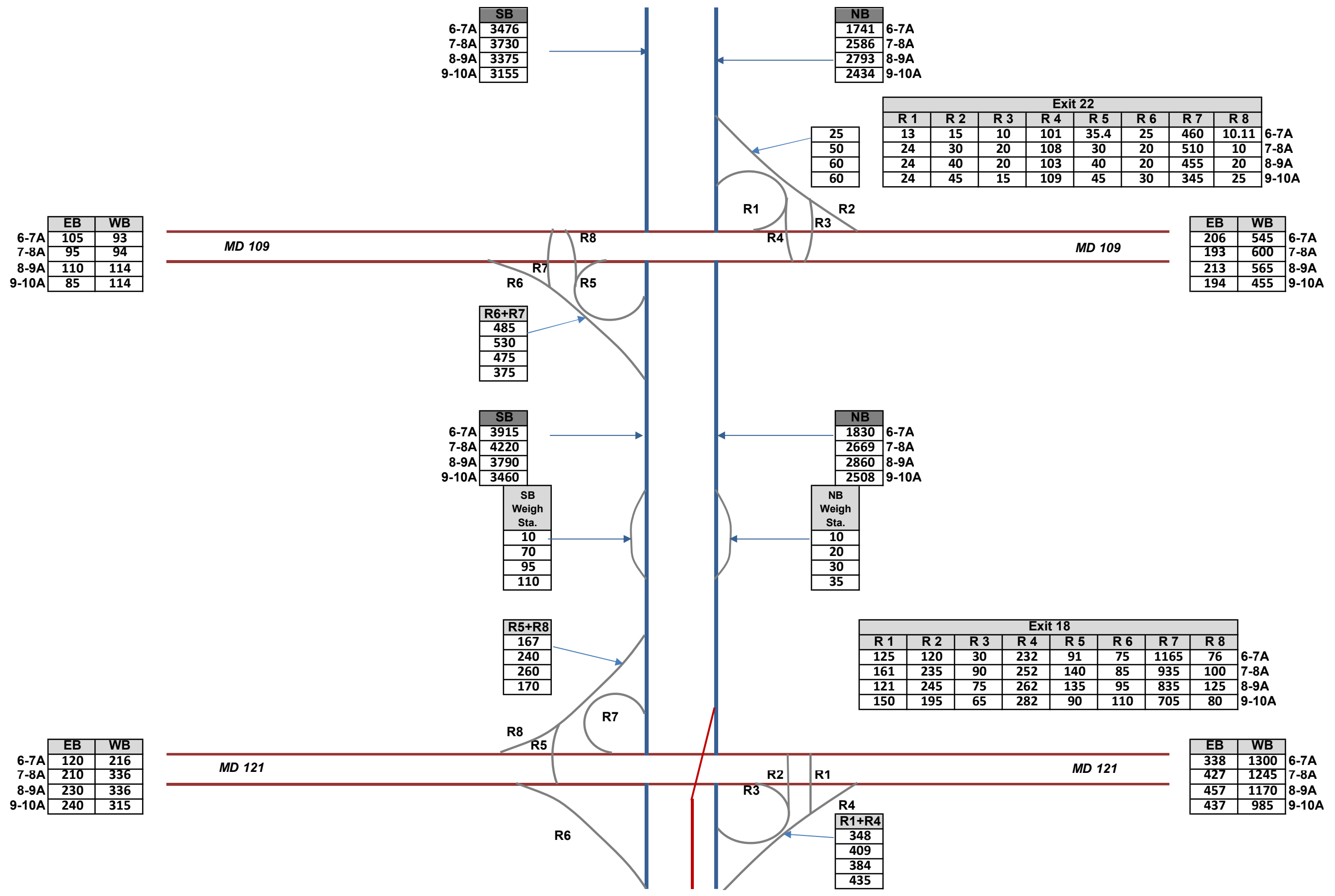
NB Ramps/P&R										
EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	
50	235	10	55	450	10	5	5	110	0	6-7A
125	290	10	35	610	10	5	10	170	0	7-8A
85	395	0	0	465	0	0	0	195	0	8-9A
70	360	0	5	430	0	0	5	150	0	9-10A

	EB	WB
6-7A	245	100
7-8A	390	175
8-9A	405	140
9-10A	355	110

EB	WB	
350	770	6-7A
470	1100	7-8A
590	960	8-9A
515	785	9-10A

	SB Ramps					
	EBT	EBR	WBL	WBT	NBL	NBR
6-7A	90	155	390	85	15	205
7-8A	140	250	485	165	10	285
8-9A	185	220	385	120	20	295
9-10A	155	200	345	100	10	275

I-270 & I-495 West Side AM
Existing Peak Period Volumes



	SB
6-7A	3476
7-8A	3730
8-9A	3375
9-10A	3155

NB	
1741	6-7A
2586	7-8A
2793	8-9A
2434	9-10A

25
50
60
60

Exit 22								
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	
13	15	10	101	35.4	25	460	10.11	6-7A
24	30	20	108	30	20	510	10	7-8A
24	40	20	103	40	20	455	20	8-9A
24	45	15	109	45	30	345	25	9-10A

	EB	WB
6-7A	105	93
7-8A	95	94
8-9A	110	114
9-10A	85	114

EB	WB	
206	545	6-7A
193	600	7-8A
213	565	8-9A
194	455	9-10A

R6+R7
485
530
475
375

	SB
6-7A	3915
7-8A	4220
8-9A	3790
9-10A	3460

NB	
1830	6-7A
2669	7-8A
2860	8-9A
2508	9-10A

SB Weigh Sta.
10
70
95
110

NB Weigh Sta.
10
20
30
35

R5+R8
167
240
260
170

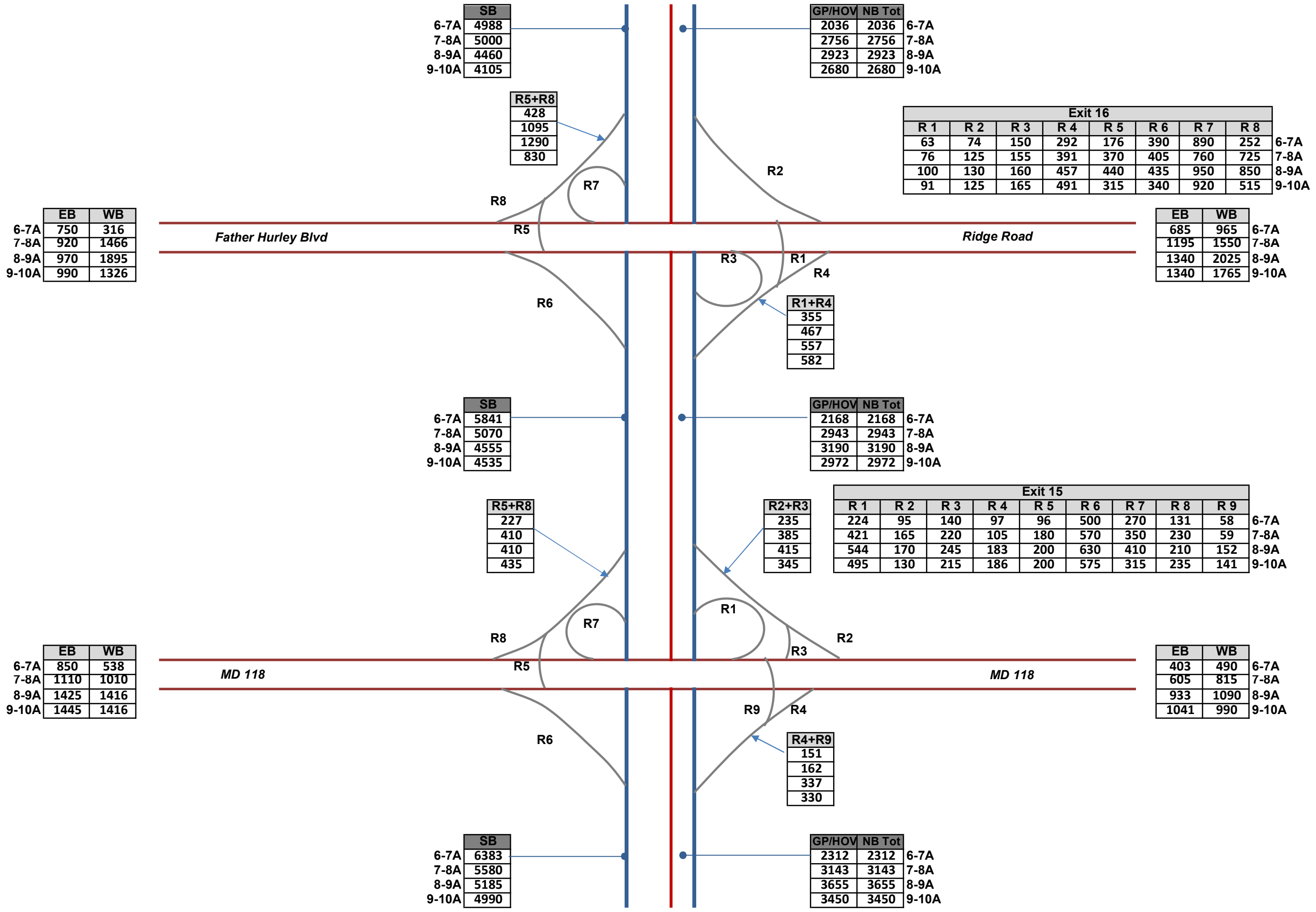
Exit 18								
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	
125	120	30	232	91	75	1165	76	6-7A
161	235	90	252	140	85	935	100	7-8A
121	245	75	262	135	95	835	125	8-9A
150	195	65	282	90	110	705	80	9-10A

	EB	WB
6-7A	120	216
7-8A	210	336
8-9A	230	336
9-10A	240	315

EB	WB	
338	1300	6-7A
427	1245	7-8A
457	1170	8-9A
437	985	9-10A

R1+R4
348
409
384
435

I-270 & I-495 West Side AM
Existing Peak Period Volumes



	SB
6-7A	4988
7-8A	5000
8-9A	4460
9-10A	4105

GP/HOV	NB Tot	
2036	2036	6-7A
2756	2756	7-8A
2923	2923	8-9A
2680	2680	9-10A

R5+R8
428
1095
1290
830

Exit 16								
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	
63	74	150	292	176	390	890	252	6-7A
76	125	155	391	370	405	760	725	7-8A
100	130	160	457	440	435	950	850	8-9A
91	125	165	491	315	340	920	515	9-10A

	EB	WB
6-7A	750	316
7-8A	920	1466
8-9A	970	1895
9-10A	990	1326

EB	WB	
685	965	6-7A
1195	1550	7-8A
1340	2025	8-9A
1340	1765	9-10A

R1+R4
355
467
557
582

	SB
6-7A	5841
7-8A	5070
8-9A	4555
9-10A	4535

GP/HOV	NB Tot	
2168	2168	6-7A
2943	2943	7-8A
3190	3190	8-9A
2972	2972	9-10A

R5+R8
227
410
410
435

R2+R3
235
385
415
345

Exit 15									
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	
224	95	140	97	96	500	270	131	58	6-7A
421	165	220	105	180	570	350	230	59	7-8A
544	170	245	183	200	630	410	210	152	8-9A
495	130	215	186	200	575	315	235	141	9-10A

	EB	WB
6-7A	850	538
7-8A	1110	1010
8-9A	1425	1416
9-10A	1445	1416

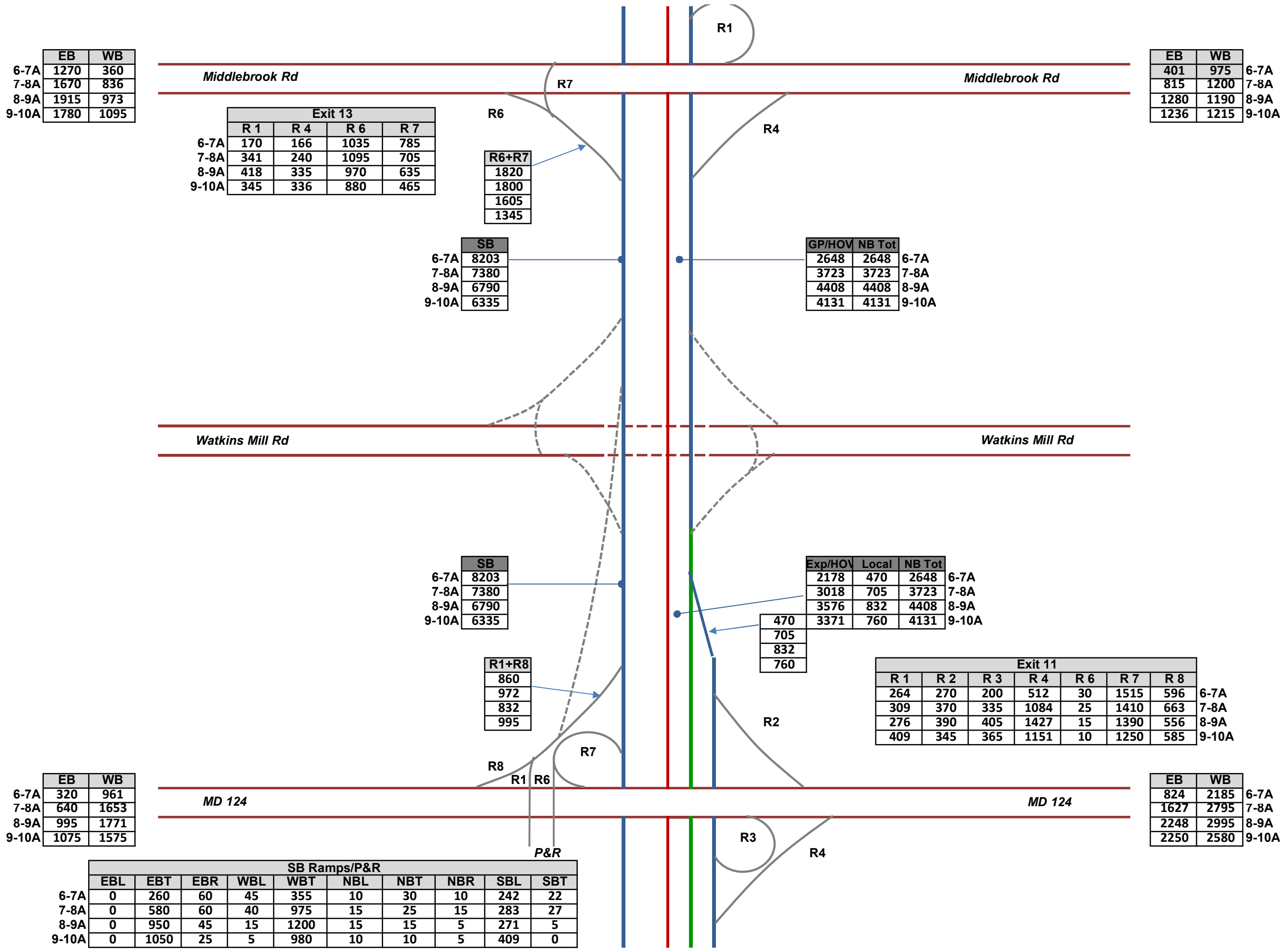
EB	WB	
403	490	6-7A
605	815	7-8A
933	1090	8-9A
1041	990	9-10A

R4+R9
151
162
337
330

	SB
6-7A	6383
7-8A	5580
8-9A	5185
9-10A	4990

GP/HOV	NB Tot	
2312	2312	6-7A
3143	3143	7-8A
3655	3655	8-9A
3450	3450	9-10A

I-270 & I-495 West Side AM
Existing Peak Period Volumes



	EB	WB
6-7A	1270	360
7-8A	1670	836
8-9A	1915	973
9-10A	1780	1095

EB	WB	
401	975	6-7A
815	1200	7-8A
1280	1190	8-9A
1236	1215	9-10A

	Exit 13			
	R 1	R 4	R 6	R 7
6-7A	170	166	1035	785
7-8A	341	240	1095	705
8-9A	418	335	970	635
9-10A	345	336	880	465

R6+R7
1820
1800
1605
1345

	SB
6-7A	8203
7-8A	7380
8-9A	6790
9-10A	6335

GP/HOV	NB Tot	
2648	2648	6-7A
3723	3723	7-8A
4408	4408	8-9A
4131	4131	9-10A

	SB
6-7A	8203
7-8A	7380
8-9A	6790
9-10A	6335

Exp/HOV	Local	NB Tot	
2178	470	2648	6-7A
3018	705	3723	7-8A
3576	832	4408	8-9A
3371	760	4131	9-10A

470
705
832
760

R1+R8
860
972
832
995

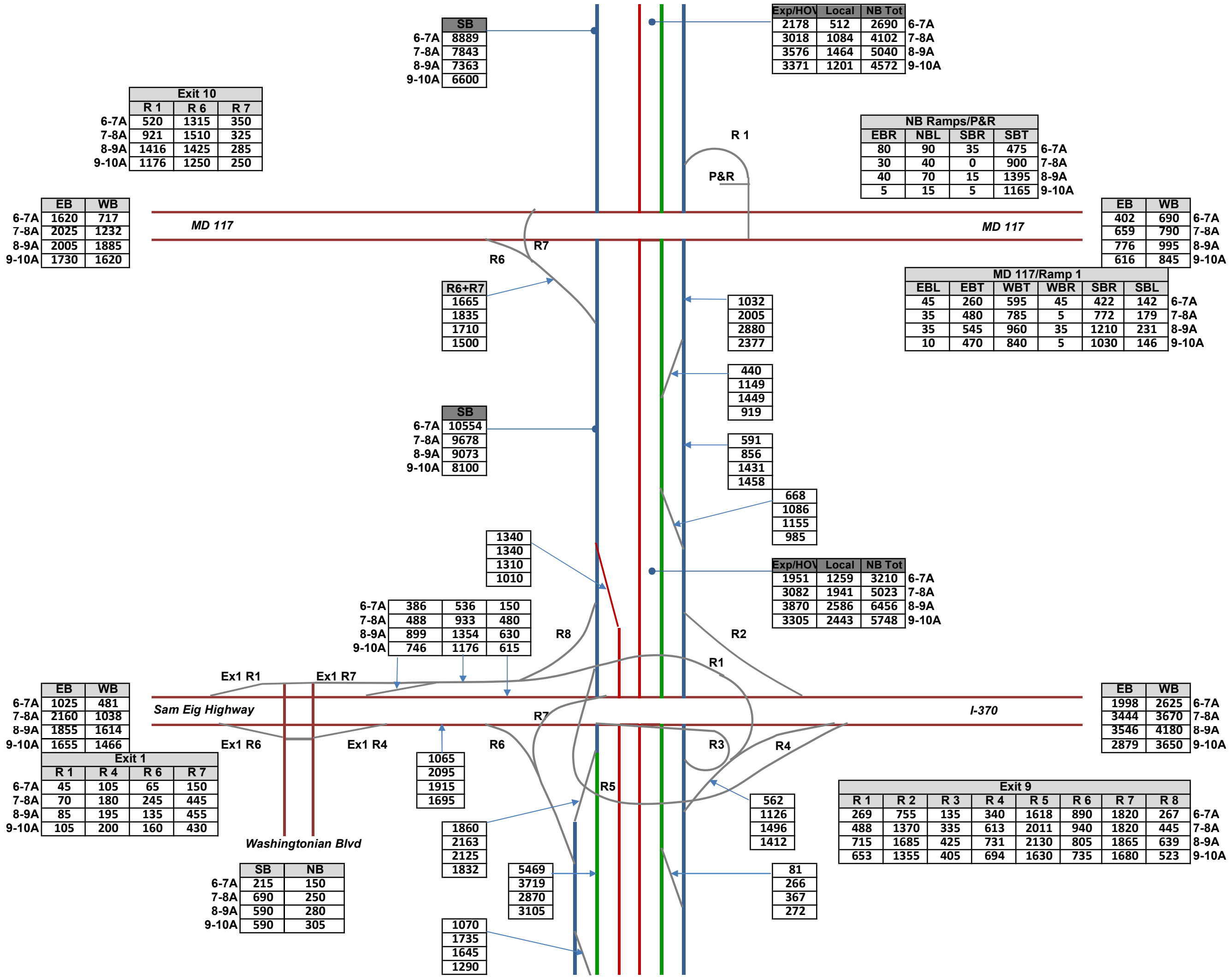
Exit 11							
R 1	R 2	R 3	R 4	R 6	R 7	R 8	
264	270	200	512	30	1515	596	6-7A
309	370	335	1084	25	1410	663	7-8A
276	390	405	1427	15	1390	556	8-9A
409	345	365	1151	10	1250	585	9-10A

	EB	WB
6-7A	320	961
7-8A	640	1653
8-9A	995	1771
9-10A	1075	1575

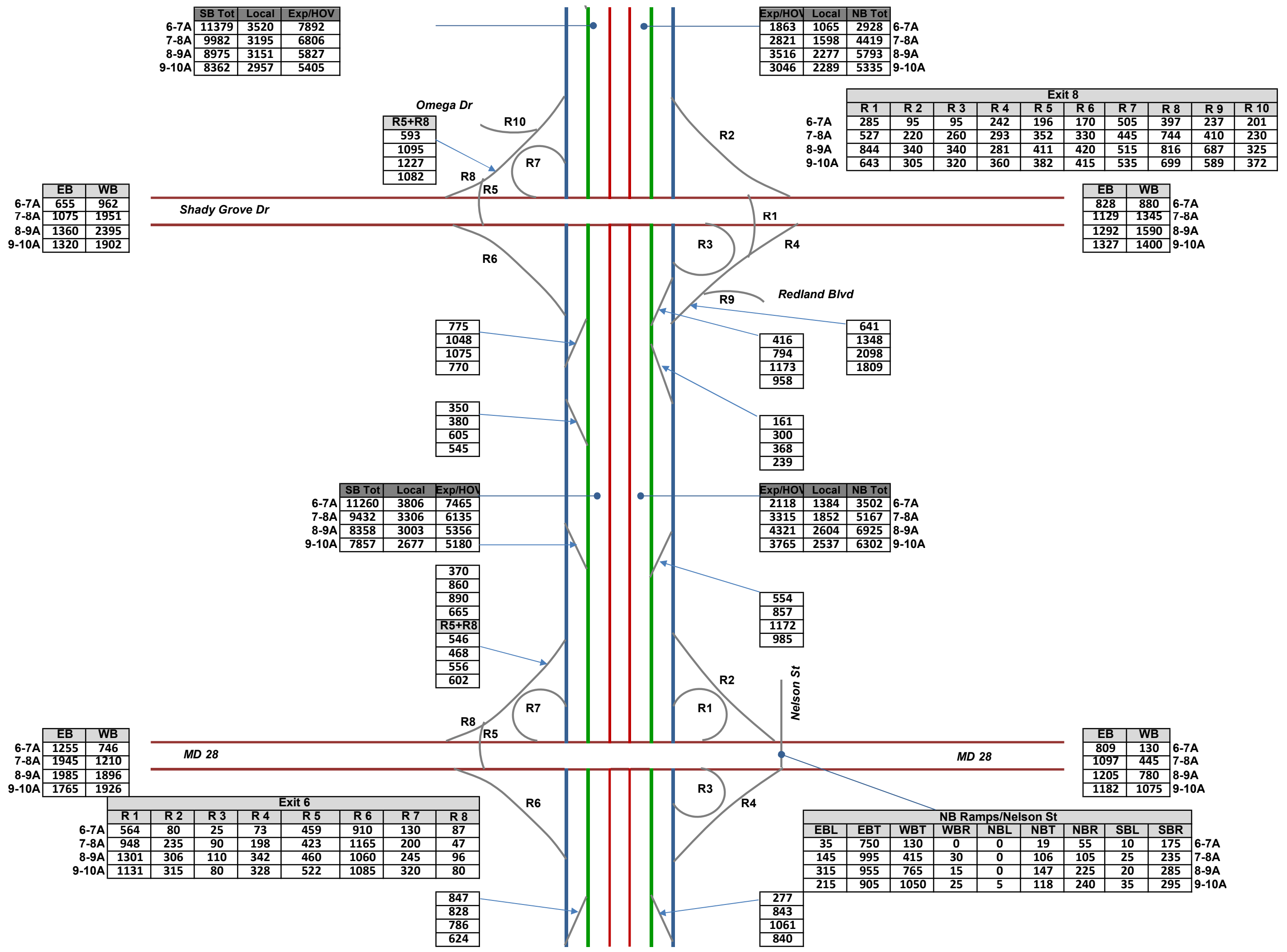
EB	WB	
824	2185	6-7A
1627	2795	7-8A
2248	2995	8-9A
2250	2580	9-10A

	SB Ramps/P&R									
	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
6-7A	0	260	60	45	355	10	30	10	242	22
7-8A	0	580	60	40	975	15	25	15	283	27
8-9A	0	950	45	15	1200	15	15	5	271	5
9-10A	0	1050	25	5	980	10	10	5	409	0

I-270 & I-495 West Side AM
Existing Peak Period Volumes



I-270 & I-495 West Side AM
Existing Peak Period Volumes



	SB Tot	Local	Exp/HOV
6-7A	11379	3520	7892
7-8A	9982	3195	6806
8-9A	8975	3151	5827
9-10A	8362	2957	5405

Exp/HOV	Local	NB Tot	
1863	1065	2928	6-7A
2821	1598	4419	7-8A
3516	2277	5793	8-9A
3046	2289	5335	9-10A

	Exit 8									
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10
6-7A	285	95	95	242	196	170	505	397	237	201
7-8A	527	220	260	293	352	330	445	744	410	230
8-9A	844	340	340	281	411	420	515	816	687	325
9-10A	643	305	320	360	382	415	535	699	589	372

R5+R8
593
1095
1227
1082

	EB	WB
6-7A	655	962
7-8A	1075	1951
8-9A	1360	2395
9-10A	1320	1902

EB	WB	
828	880	6-7A
1129	1345	7-8A
1292	1590	8-9A
1327	1400	9-10A

775
1048
1075
770

416
794
1173
958

641
1348
2098
1809

350
380
605
545

161
300
368
239

	SB Tot	Local	Exp/HOV
6-7A	11260	3806	7465
7-8A	9432	3306	6135
8-9A	8358	3003	5356
9-10A	7857	2677	5180

Exp/HOV	Local	NB Tot	
2118	1384	3502	6-7A
3315	1852	5167	7-8A
4321	2604	6925	8-9A
3765	2537	6302	9-10A

370
860
890
665
R5+R8
546
468
556
602

554
857
1172
985

	EB	WB
6-7A	1255	746
7-8A	1945	1210
8-9A	1985	1896
9-10A	1765	1926

EB	WB	
809	130	6-7A
1097	445	7-8A
1205	780	8-9A
1182	1075	9-10A

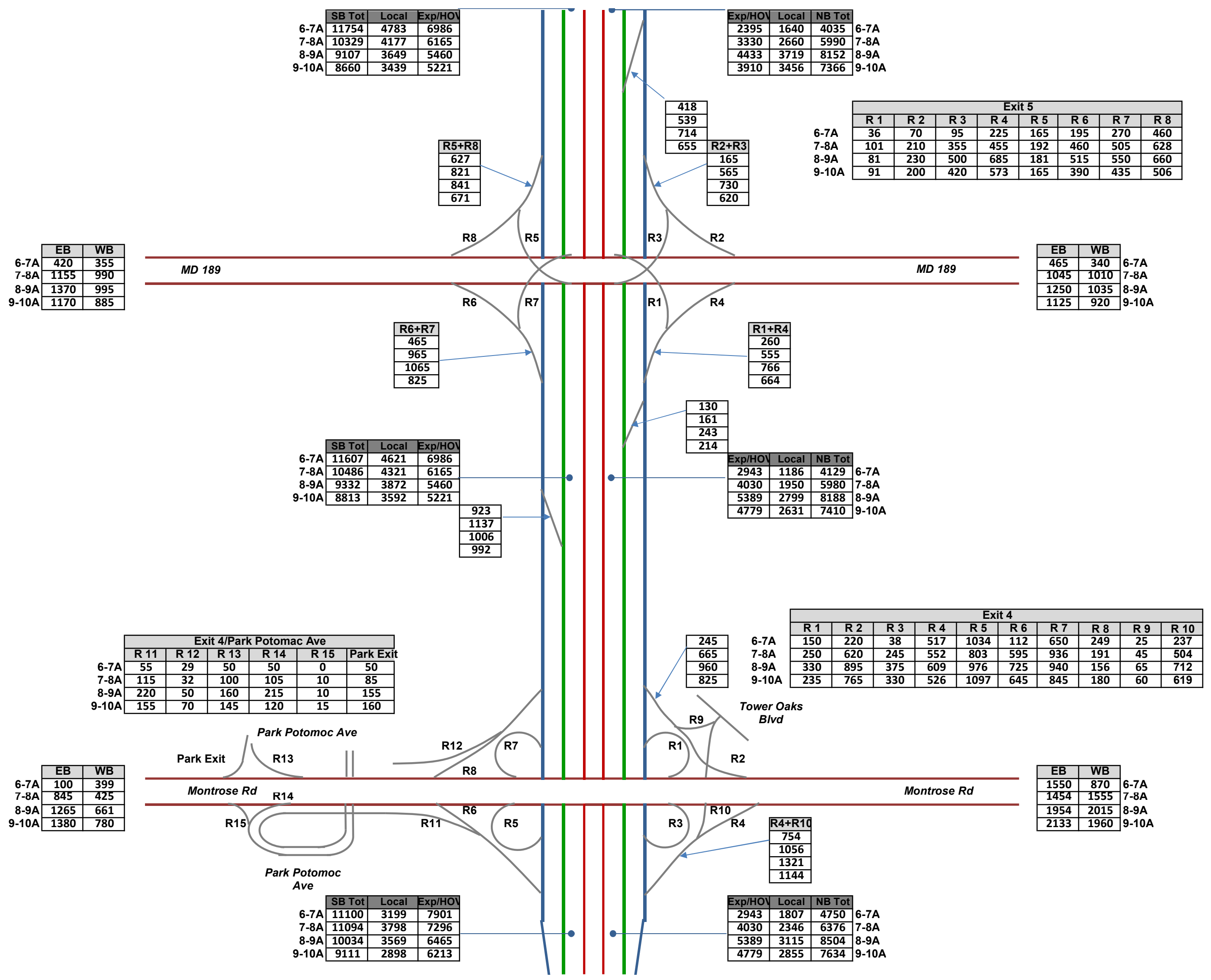
	Exit 6							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	564	80	25	73	459	910	130	87
7-8A	948	235	90	198	423	1165	200	47
8-9A	1301	306	110	342	460	1060	245	96
9-10A	1131	315	80	328	522	1085	320	80

NB Ramps/Nelson St									
EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR	
35	750	130	0	0	19	55	10	175	6-7A
145	995	415	30	0	106	105	25	235	7-8A
315	955	765	15	0	147	225	20	285	8-9A
215	905	1050	25	5	118	240	35	295	9-10A

847
828
786
624

277
843
1061
840

I-270 & I-495 West Side AM
Existing Peak Period Volumes



	SB Tot	Local	Exp/HOV
6-7A	11754	4783	6986
7-8A	10329	4177	6165
8-9A	9107	3649	5460
9-10A	8660	3439	5221

Exp/HOV	Local	NB Tot	
2395	1640	4035	6-7A
3330	2660	5990	7-8A
4433	3719	8152	8-9A
3910	3456	7366	9-10A

418
539
714
655

	Exit 5							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	36	70	95	225	165	195	270	460
7-8A	101	210	355	455	192	460	505	628
8-9A	81	230	500	685	181	515	550	660
9-10A	91	200	420	573	165	390	435	506

R5+R8
627
821
841
671

R2+R3
165
565
730
620

	EB	WB
6-7A	420	355
7-8A	1155	990
8-9A	1370	995
9-10A	1170	885

EB	WB	
465	340	6-7A
1045	1010	7-8A
1250	1035	8-9A
1125	920	9-10A

R6+R7
465
965
1065
825

R1+R4
260
555
766
664

130
161
243
214

	SB Tot	Local	Exp/HOV
6-7A	11607	4621	6986
7-8A	10486	4321	6165
8-9A	9332	3872	5460
9-10A	8813	3592	5221

Exp/HOV	Local	NB Tot	
2943	1186	4129	6-7A
4030	1950	5980	7-8A
5389	2799	8188	8-9A
4779	2631	7410	9-10A

923
1137
1006
992

	Exit 4									
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10
6-7A	150	220	38	517	1034	112	650	249	25	237
7-8A	250	620	245	552	803	595	936	191	45	504
8-9A	330	895	375	609	976	725	940	156	65	712
9-10A	235	765	330	526	1097	645	845	180	60	619

245
665
960
825

	Exit 4/Park Potomac Ave					
	R 11	R 12	R 13	R 14	R 15	Park Exit
6-7A	55	29	50	50	0	50
7-8A	115	32	100	105	10	85
8-9A	220	50	160	215	10	155
9-10A	155	70	145	120	15	160

	EB	WB
6-7A	100	399
7-8A	845	425
8-9A	1265	661
9-10A	1380	780

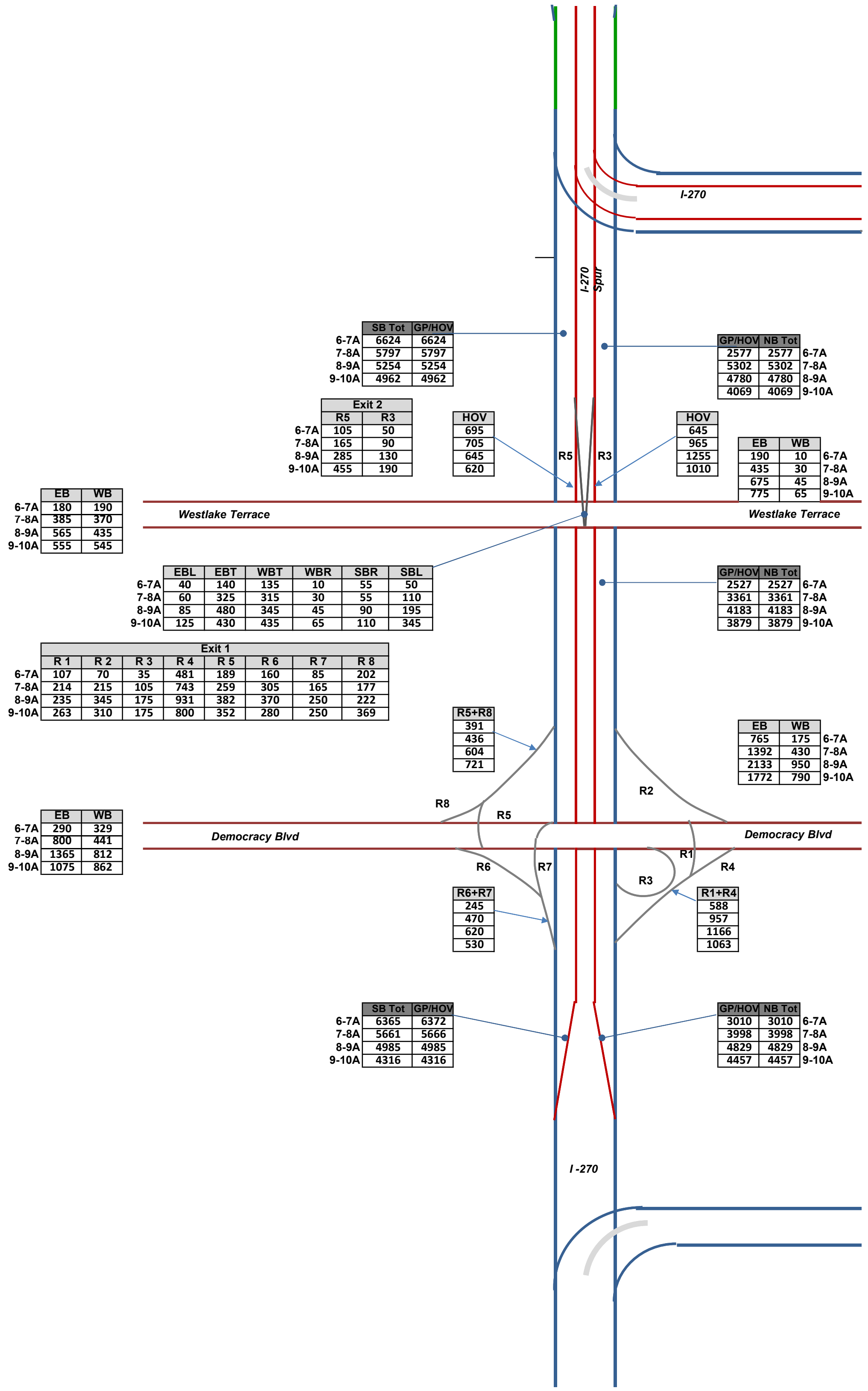
EB	WB	
1550	870	6-7A
1454	1555	7-8A
1954	2015	8-9A
2133	1960	9-10A

R4+R10
754
1056
1321
1144

	SB Tot	Local	Exp/HOV
6-7A	11100	3199	7901
7-8A	11094	3798	7296
8-9A	10034	3569	6465
9-10A	9111	2898	6213

Exp/HOV	Local	NB Tot	
2943	1807	4750	6-7A
4030	2346	6376	7-8A
5389	3115	8504	8-9A
4779	2855	7634	9-10A

I-270 & I-495 West Side AM
Existing Peak Period Volumes



	SB Tot	GP/HOV
6-7A	6624	6624
7-8A	5797	5797
8-9A	5254	5254
9-10A	4962	4962

GP/HOV	NB Tot	
2577	2577	6-7A
5302	5302	7-8A
4780	4780	8-9A
4069	4069	9-10A

	Exit 2	
	R5	R3
6-7A	105	50
7-8A	165	90
8-9A	285	130
9-10A	455	190

HOV
695
705
645
620

HOV
645
965
1255
1010

EB	WB	
190	10	6-7A
435	30	7-8A
675	45	8-9A
775	65	9-10A

	EB	WB
6-7A	180	190
7-8A	385	370
8-9A	565	435
9-10A	555	545

	EBL	EBT	WBT	WBR	SBR	SBL
6-7A	40	140	135	10	55	50
7-8A	60	325	315	30	55	110
8-9A	85	480	345	45	90	195
9-10A	125	430	435	65	110	345

GP/HOV	NB Tot	
2527	2527	6-7A
3361	3361	7-8A
4183	4183	8-9A
3879	3879	9-10A

	Exit 1							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	107	70	35	481	189	160	85	202
7-8A	214	215	105	743	259	305	165	177
8-9A	235	345	175	931	382	370	250	222
9-10A	263	310	175	800	352	280	250	369

R5+R8
391
436
604
721

EB	WB	
765	175	6-7A
1392	430	7-8A
2133	950	8-9A
1772	790	9-10A

	EB	WB
6-7A	290	329
7-8A	800	441
8-9A	1365	812
9-10A	1075	862

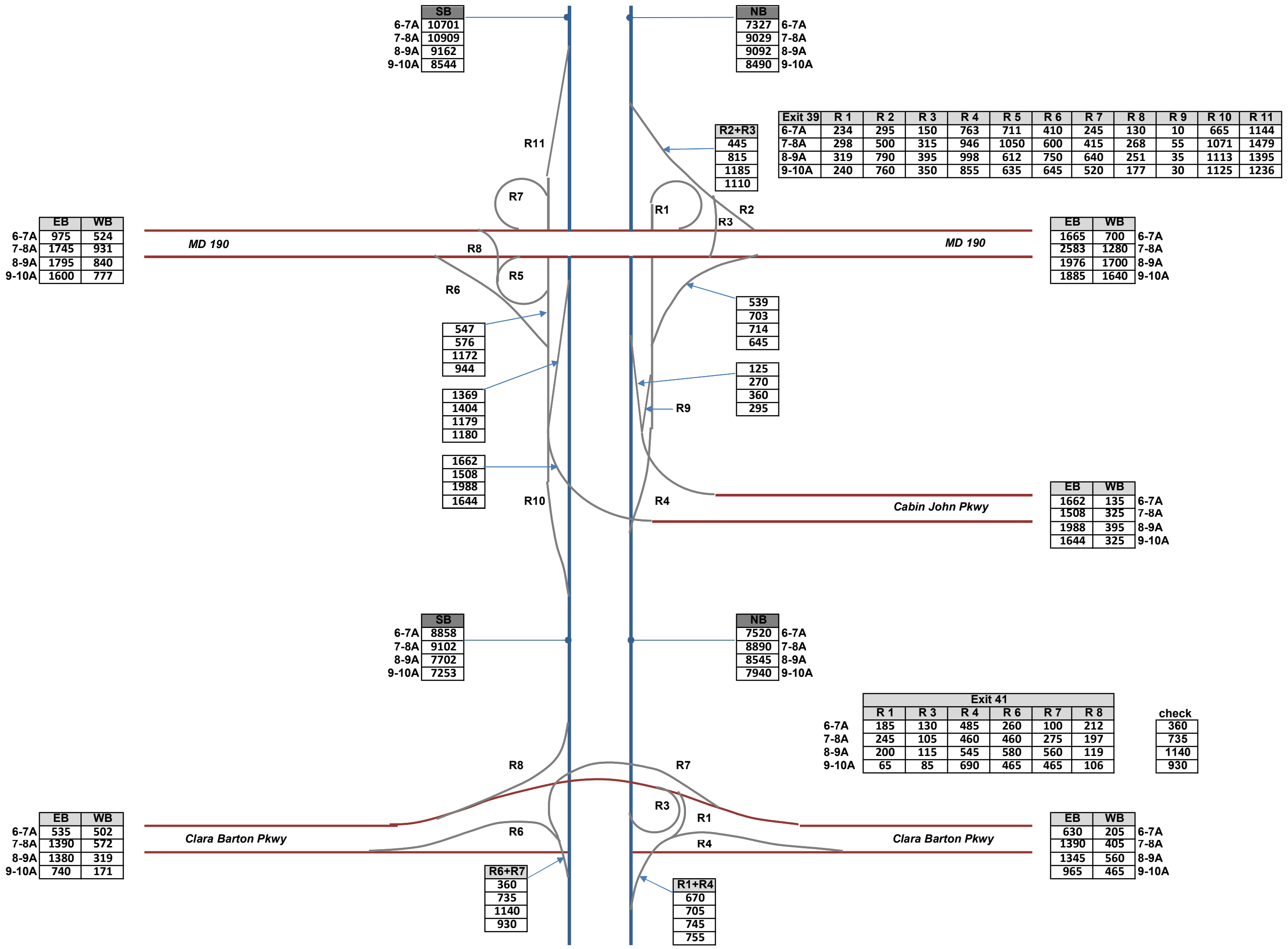
R6+R7
245
470
620
530

R1+R4
588
957
1166
1063

	SB Tot	GP/HOV
6-7A	6365	6372
7-8A	5661	5666
8-9A	4985	4985
9-10A	4316	4316

GP/HOV	NB Tot	
3010	3010	6-7A
3998	3998	7-8A
4829	4829	8-9A
4457	4457	9-10A

I-270 & I-495 West Side AM
Existing Peak Period Volumes



	SB
6-7A	10701
7-8A	10909
8-9A	9162
9-10A	8544

NB	
7327	6-7A
9029	7-8A
9092	8-9A
8490	9-10A

R2+R3
445
815
1185
1110

Exit 39	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11
6-7A	234	295	150	763	711	410	245	130	10	665	1144
7-8A	298	500	315	946	1050	600	415	268	55	1071	1479
8-9A	319	790	395	998	612	750	640	251	35	1113	1395
9-10A	240	760	350	855	635	645	520	177	30	1125	1236

	EB	WB
6-7A	975	524
7-8A	1745	931
8-9A	1795	840
9-10A	1600	777

EB	WB	
1665	700	6-7A
2583	1280	7-8A
1976	1700	8-9A
1885	1640	9-10A

539
703
714
645

547
576
1172
944

125
270
360
295

1369
1404
1179
1180

1662
1508
1988
1644

EB	WB	
1662	135	6-7A
1508	325	7-8A
1988	395	8-9A
1644	325	9-10A

	SB
6-7A	8858
7-8A	9102
8-9A	7702
9-10A	7253

NB	
7520	6-7A
8890	7-8A
8545	8-9A
7940	9-10A

	Exit 41					
	R 1	R 3	R 4	R 6	R 7	R 8
6-7A	185	130	485	260	100	212
7-8A	245	105	460	460	275	197
8-9A	200	115	545	580	560	119
9-10A	65	85	690	465	465	106

check
360
735
1140
930

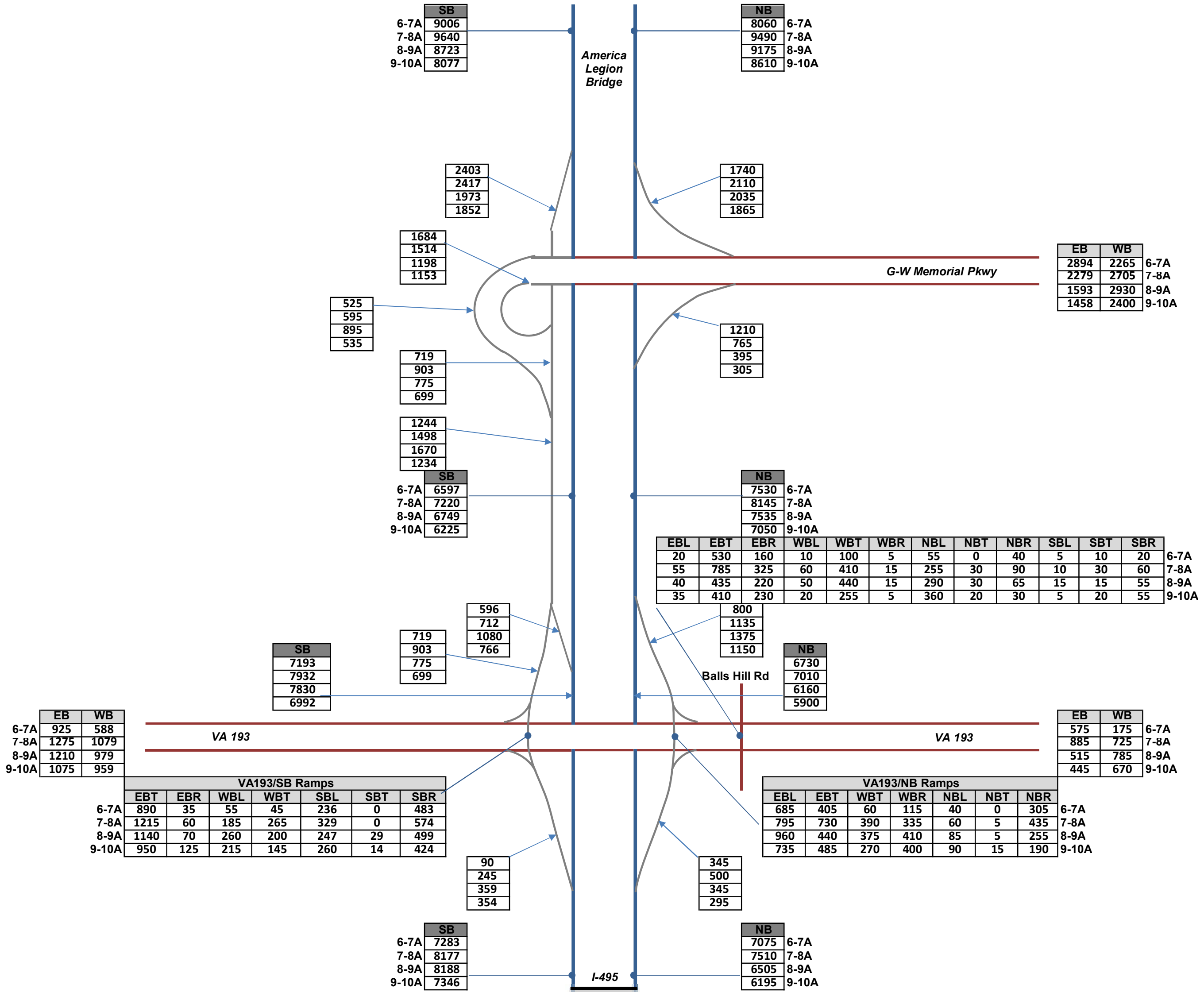
	EB	WB
6-7A	535	502
7-8A	1390	572
8-9A	1380	319
9-10A	740	171

EB	WB	
630	205	6-7A
1390	405	7-8A
1345	560	8-9A
965	465	9-10A

R6+R7
360
735
1140
930

R1+R4
670
705
745
755

I-270 & I-495 West Side AM
Existing Peak Period Volumes



	SB	NB	
6-7A	9006	8060	6-7A
7-8A	9640	9490	7-8A
8-9A	8723	9175	8-9A
9-10A	8077	8610	9-10A

G-W Memorial Pkwy

EB	WB	
2894	2265	6-7A
2279	2705	7-8A
1593	2930	8-9A
1458	2400	9-10A

	SB	NB	
6-7A	6597	7530	6-7A
7-8A	7220	8145	7-8A
8-9A	6749	7535	8-9A
9-10A	6225	7050	9-10A

EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
20	530	160	10	100	5	55	0	40	5	10	20	6-7A
55	785	325	60	410	15	255	30	90	10	30	60	7-8A
40	435	220	50	440	15	290	30	65	15	15	55	8-9A
35	410	230	20	255	5	360	20	30	5	20	55	9-10A

SB	NB
7193	6730
7932	7010
7830	6160
6992	5900

VA 193

	EB	WB
6-7A	925	588
7-8A	1275	1079
8-9A	1210	979
9-10A	1075	959

EB	WB	
575	175	6-7A
885	725	7-8A
515	785	8-9A
445	670	9-10A

VA193/SB Ramps

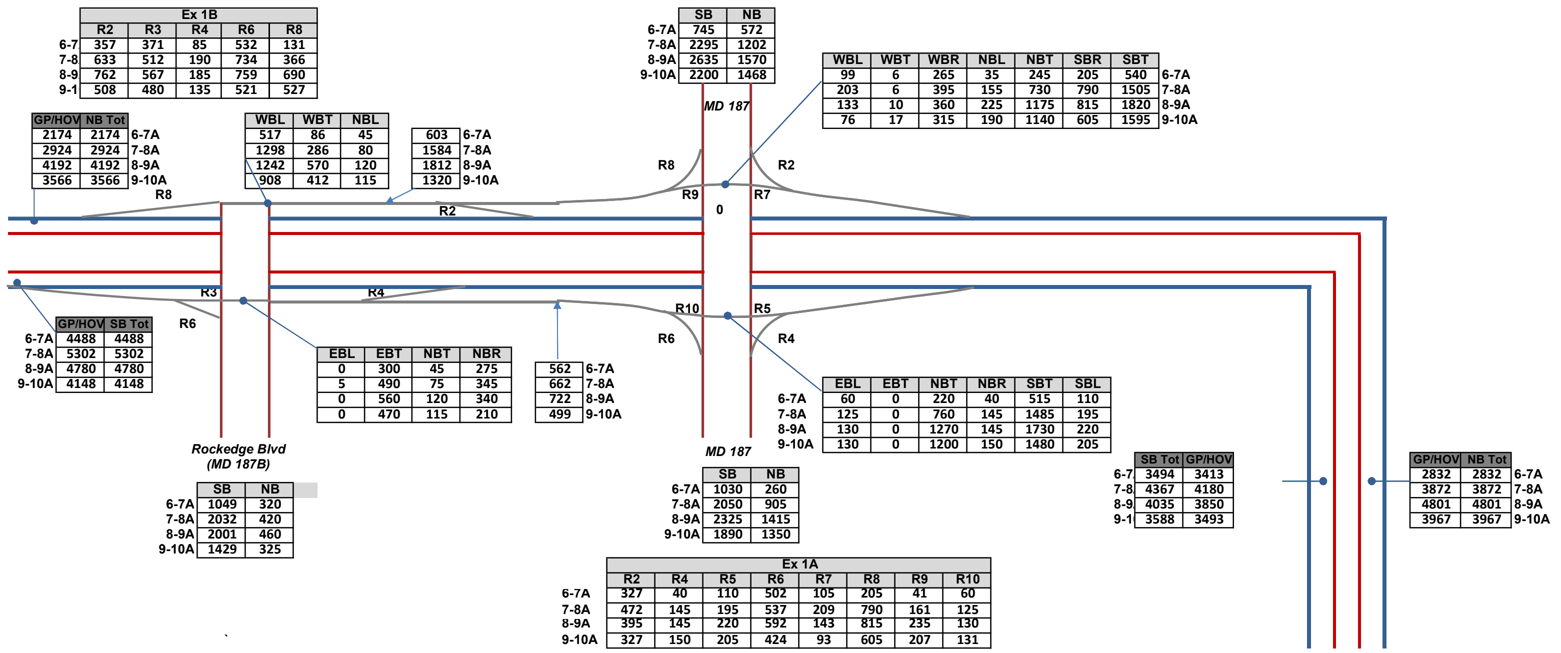
	EBT	EBR	WBL	WBT	SBL	SBT	SBR
6-7A	890	35	55	45	236	0	483
7-8A	1215	60	185	265	329	0	574
8-9A	1140	70	260	200	247	29	499
9-10A	950	125	215	145	260	14	424

VA193/NB Ramps

EBL	EBT	WBT	WBR	NBL	NBT	NBR	
685	405	60	115	40	0	305	6-7A
795	730	390	335	60	5	435	7-8A
960	440	375	410	85	5	255	8-9A
735	485	270	400	90	15	190	9-10A

	SB	NB	
6-7A	7283	7075	6-7A
7-8A	8177	7510	7-8A
8-9A	8188	6505	8-9A
9-10A	7346	6195	9-10A

I-270 & I-495 West Side AM
Existing Peak Period Volumes



	Ex 1B				
	R2	R3	R4	R6	R8
6-7	357	371	85	532	131
7-8	633	512	190	734	366
8-9	762	567	185	759	690
9-1	508	480	135	521	527

GP/HOV	NB Tot	
2174	2174	6-7A
2924	2924	7-8A
4192	4192	8-9A
3566	3566	9-10A

WBL	WBT	NBL
517	86	45
1298	286	80
1242	570	120
908	412	115

603	6-7A
1584	7-8A
1812	8-9A
1320	9-10A

	SB	NB
6-7A	745	572
7-8A	2295	1202
8-9A	2635	1570
9-10A	2200	1468

WBL	WBT	WBR	NBL	NBT	SBR	SBT	
99	6	265	35	245	205	540	6-7A
203	6	395	155	730	790	1505	7-8A
133	10	360	225	1175	815	1820	8-9A
76	17	315	190	1140	605	1595	9-10A

	GP/HOV	SB Tot
6-7A	4488	4488
7-8A	5302	5302
8-9A	4780	4780
9-10A	4148	4148

EBL	EBT	NBT	NBR
0	300	45	275
5	490	75	345
0	560	120	340
0	470	115	210

562	6-7A
662	7-8A
722	8-9A
499	9-10A

	EBL	EBT	NBT	NBR	SBT	SBL
6-7A	60	0	220	40	515	110
7-8A	125	0	760	145	1485	195
8-9A	130	0	1270	145	1730	220
9-10A	130	0	1200	150	1480	205

	SB	NB
6-7A	1049	320
7-8A	2032	420
8-9A	2001	460
9-10A	1429	325

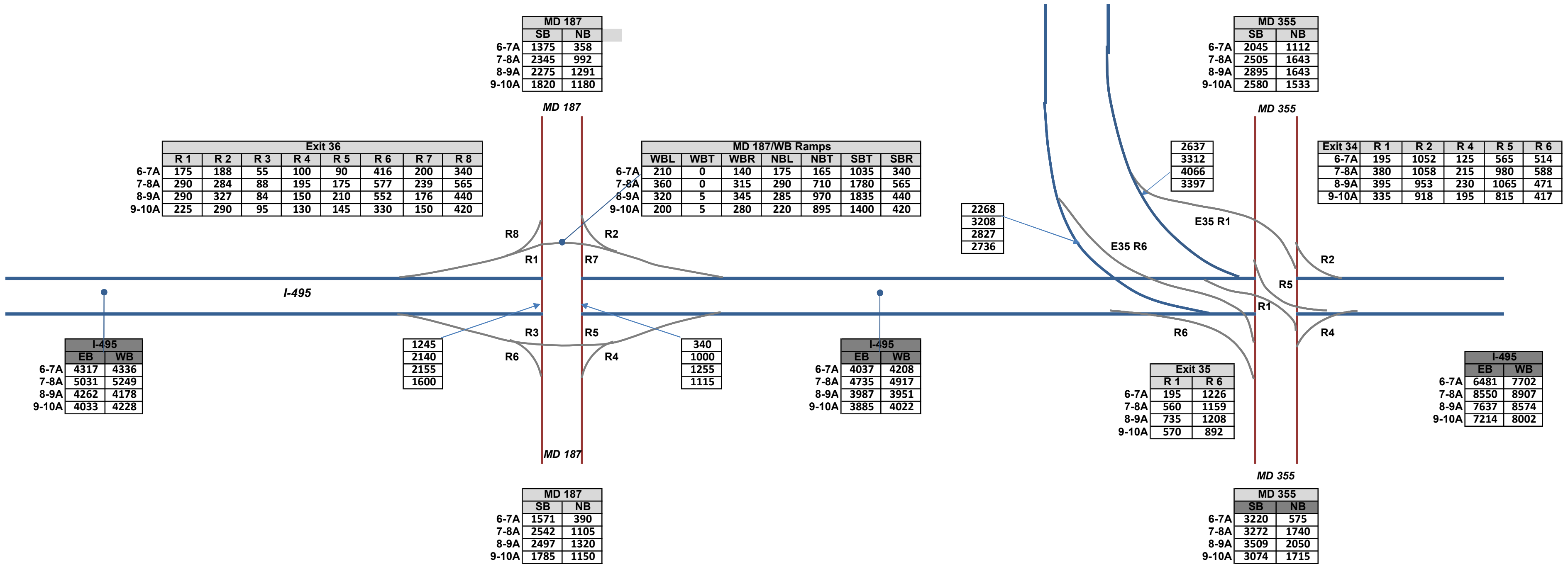
	SB	NB
6-7A	1030	260
7-8A	2050	905
8-9A	2325	1415
9-10A	1890	1350

	SB Tot	GP/HOV
6-7	3494	3413
7-8	4367	4180
8-9	4035	3850
9-1	3588	3493

GP/HOV	NB Tot	
2832	2832	6-7A
3872	3872	7-8A
4801	4801	8-9A
3967	3967	9-10A

	Ex 1A							
	R2	R4	R5	R6	R7	R8	R9	R10
6-7A	327	40	110	502	105	205	41	60
7-8A	472	145	195	537	209	790	161	125
8-9A	395	145	220	592	143	815	235	130
9-10A	327	150	205	424	93	605	207	131

I-270 & I-495 West Side AM
Existing Peak Period Volumes



	MD 187	
	SB	NB
6-7A	1375	358
7-8A	2345	992
8-9A	2275	1291
9-10A	1820	1180

	Exit 36							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	175	188	55	100	90	416	200	340
7-8A	290	284	88	195	175	577	239	565
8-9A	290	327	84	150	210	552	176	440
9-10A	225	290	95	130	145	330	150	420

	MD 187/WB Ramps						
	WBL	WBT	WBR	NBL	NBT	SBT	SBR
6-7A	210	0	140	175	165	1035	340
7-8A	360	0	315	290	710	1780	565
8-9A	320	5	345	285	970	1835	440
9-10A	200	5	280	220	895	1400	420

2268
3208
2827
2736

	MD 355	
	SB	NB
6-7A	2045	1112
7-8A	2505	1643
8-9A	2895	1643
9-10A	2580	1533

2637
3312
4066
3397

Exit 34	R 1	R 2	R 4	R 5	R 6
6-7A	195	1052	125	565	514
7-8A	380	1058	215	980	588
8-9A	395	953	230	1065	471
9-10A	335	918	195	815	417

	I-495	
	EB	WB
6-7A	4317	4336
7-8A	5031	5249
8-9A	4262	4178
9-10A	4033	4228

1245
2140
2155
1600

340
1000
1255
1115

	I-495	
	EB	WB
6-7A	4037	4208
7-8A	4735	4917
8-9A	3987	3951
9-10A	3885	4022

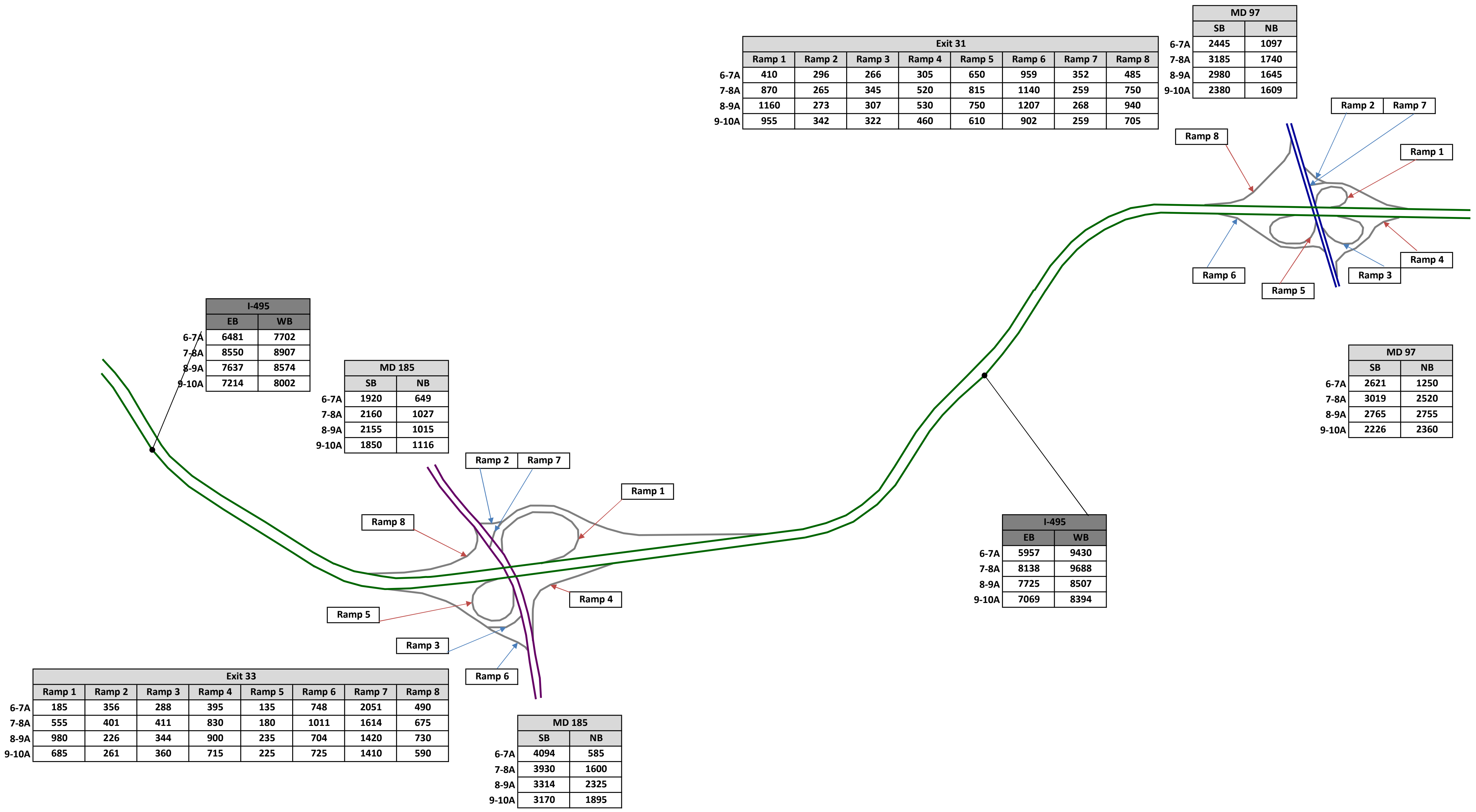
	Exit 35	
	R 1	R 6
6-7A	195	1226
7-8A	560	1159
8-9A	735	1208
9-10A	570	892

	I-495	
	EB	WB
6-7A	6481	7702
7-8A	8550	8907
8-9A	7637	8574
9-10A	7214	8002

	MD 187	
	SB	NB
6-7A	1571	390
7-8A	2542	1105
8-9A	2497	1320
9-10A	1785	1150

	MD 355	
	SB	NB
6-7A	3220	575
7-8A	3272	1740
8-9A	3509	2050
9-10A	3074	1715

I-495 North Side AM
Existing Peak Period Volumes



	Exit 31							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	410	296	266	305	650	959	352	485
7-8A	870	265	345	520	815	1140	259	750
8-9A	1160	273	307	530	750	1207	268	940
9-10A	955	342	322	460	610	902	259	705

	MD 97	
	SB	NB
6-7A	2445	1097
7-8A	3185	1740
8-9A	2980	1645
9-10A	2380	1609

	I-495	
	EB	WB
6-7A	6481	7702
7-8A	8550	8907
8-9A	7637	8574
9-10A	7214	8002

	MD 185	
	SB	NB
6-7A	1920	649
7-8A	2160	1027
8-9A	2155	1015
9-10A	1850	1116

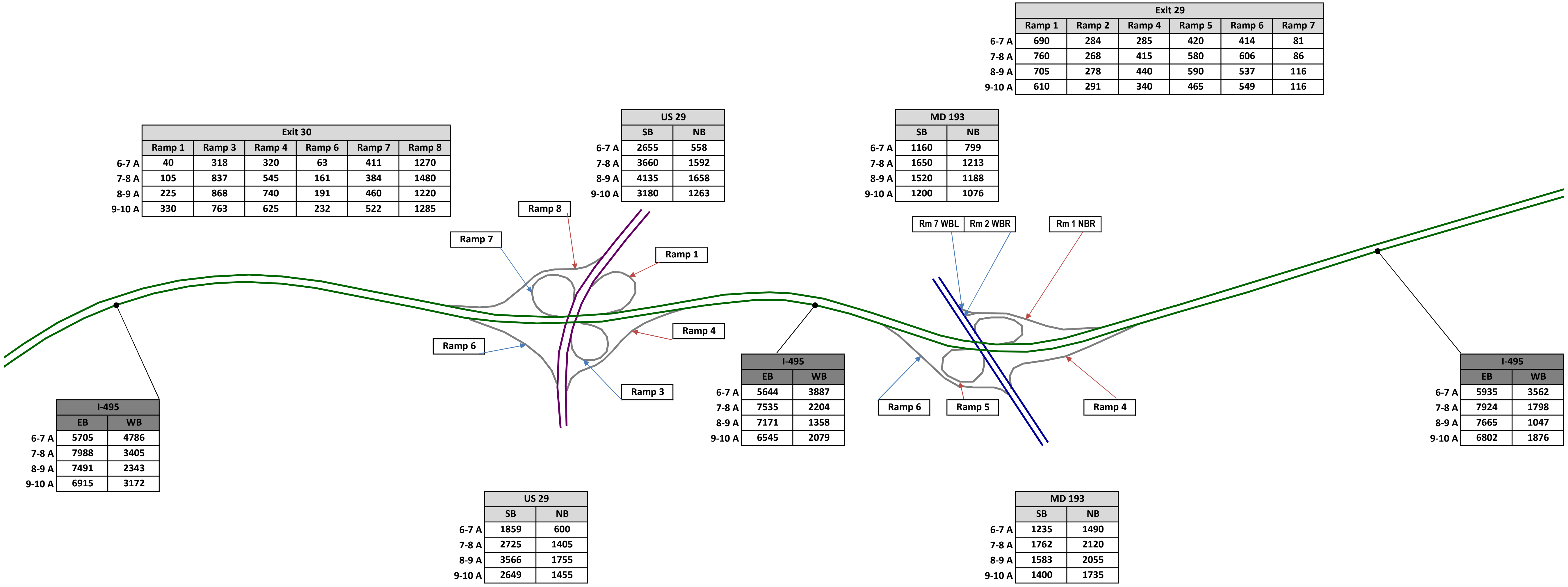
	MD 97	
	SB	NB
6-7A	2621	1250
7-8A	3019	2520
8-9A	2765	2755
9-10A	2226	2360

	I-495	
	EB	WB
6-7A	5957	9430
7-8A	8138	9688
8-9A	7725	8507
9-10A	7069	8394

	Exit 33							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	185	356	288	395	135	748	2051	490
7-8A	555	401	411	830	180	1011	1614	675
8-9A	980	226	344	900	235	704	1420	730
9-10A	685	261	360	715	225	725	1410	590

	MD 185	
	SB	NB
6-7A	4094	585
7-8A	3930	1600
8-9A	3314	2325
9-10A	3170	1895

I-495 North Side AM
Existing Peak Period Volumes



	Exit 29					
	Ramp 1	Ramp 2	Ramp 4	Ramp 5	Ramp 6	Ramp 7
6-7 A	690	284	285	420	414	81
7-8 A	760	268	415	580	606	86
8-9 A	705	278	440	590	537	116
9-10 A	610	291	340	465	549	116

	Exit 30					
	Ramp 1	Ramp 3	Ramp 4	Ramp 6	Ramp 7	Ramp 8
6-7 A	40	318	320	63	411	1270
7-8 A	105	837	545	161	384	1480
8-9 A	225	868	740	191	460	1220
9-10 A	330	763	625	232	522	1285

	US 29	
	SB	NB
6-7 A	2655	558
7-8 A	3660	1592
8-9 A	4135	1658
9-10 A	3180	1263

	MD 193	
	SB	NB
6-7 A	1160	799
7-8 A	1650	1213
8-9 A	1520	1188
9-10 A	1200	1076

	I-495	
	EB	WB
6-7 A	5644	3887
7-8 A	7535	2204
8-9 A	7171	1358
9-10 A	6545	2079

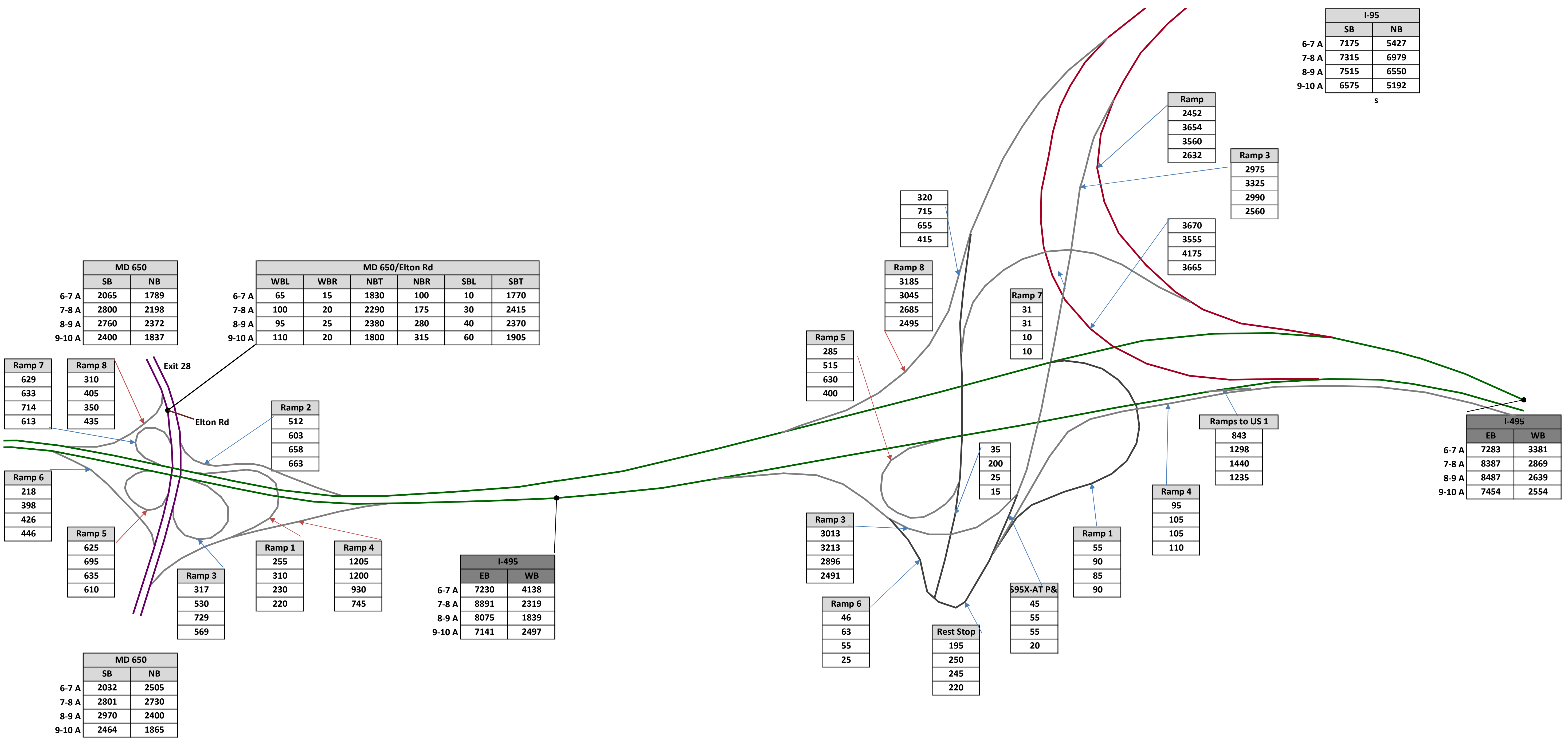
	I-495	
	EB	WB
6-7 A	5935	3562
7-8 A	7924	1798
8-9 A	7665	1047
9-10 A	6802	1876

	I-495	
	EB	WB
6-7 A	5705	4786
7-8 A	7988	3405
8-9 A	7491	2343
9-10 A	6915	3172

	US 29	
	SB	NB
6-7 A	1859	600
7-8 A	2725	1405
8-9 A	3566	1755
9-10 A	2649	1455

	MD 193	
	SB	NB
6-7 A	1235	1490
7-8 A	1762	2120
8-9 A	1583	2055
9-10 A	1400	1735

I-495 North Side AM
Existing Peak Period Volumes



	MD 650	
	SB	NB
6-7 A	2065	1789
7-8 A	2800	2198
8-9 A	2760	2372
9-10 A	2400	1837

	MD 650/Elton Rd					
	WBL	WBR	NBT	NBR	SBL	SBT
6-7 A	65	15	1830	100	10	1770
7-8 A	100	20	2290	175	30	2415
8-9 A	95	25	2380	280	40	2370
9-10 A	110	20	1800	315	60	1905

Ramp 7	Ramp 8	Ramp 2	Ramp 6	Ramp 5	Ramp 3	Ramp 1	Ramp 4
629	310	512	218	625	317	255	1205
633	405	603	398	695	530	310	1200
714	350	658	426	635	729	230	930
613	435	663	446	610	569	220	745

	I-495	
	EB	WB
6-7 A	7230	4138
7-8 A	8891	2319
8-9 A	8075	1839
9-10 A	7141	2497

	MD 650	
	SB	NB
6-7 A	2032	2505
7-8 A	2801	2730
8-9 A	2970	2400
9-10 A	2464	1865

320
715
655
415

Ramp 8	Ramp 5	Ramp 7	Ramp 3	Ramp 6	Rest Stop	I95X-AT P&	Ramp 1	Ramp 4	Ramps to US 1
3185	285	31	3013	46	195	45	55	95	843
3045	515	31	3213	63	250	55	90	105	1298
2685	630	10	2896	55	245	55	85	105	1440
2495	400	10	2491	25	220	20	90	110	1235

35
200
25
15

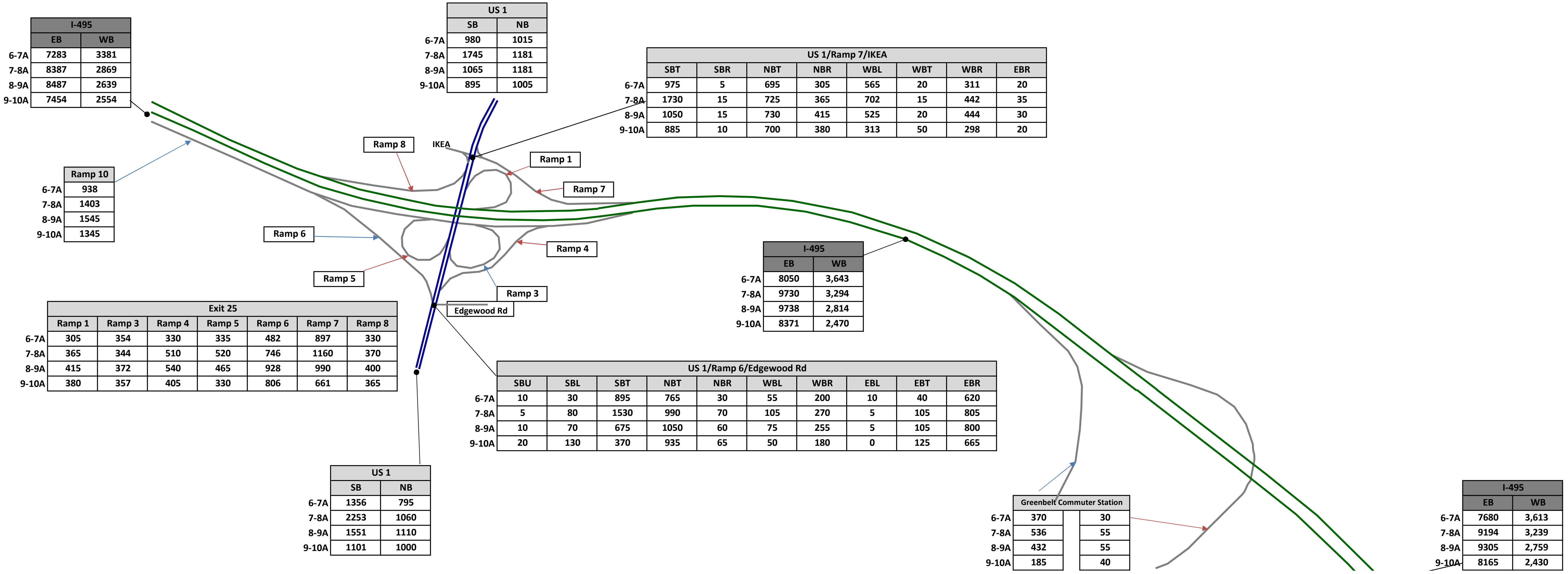
Ramp	Ramp 3
2452	2975
3654	3325
3560	2990
2632	2560

3670
3555
4175
3665

	I-95	
	SB	NB
6-7 A	7175	5427
7-8 A	7315	6979
8-9 A	7515	6550
9-10 A	6575	5192

	I-495	
	EB	WB
6-7 A	7283	3381
7-8 A	8387	2869
8-9 A	8487	2639
9-10 A	7454	2554

I-495 Northeast Side AM
Existing Peak Period Volumes



	I-495	
	EB	WB
6-7A	7283	3381
7-8A	8387	2869
8-9A	8487	2639
9-10A	7454	2554

	US 1	
	SB	NB
6-7A	980	1015
7-8A	1745	1181
8-9A	1065	1181
9-10A	895	1005

	US 1/Ramp 7/IKEA							
	SBT	SBR	NBT	NBR	WBL	WBT	WBR	EBR
6-7A	975	5	695	305	565	20	311	20
7-8A	1730	15	725	365	702	15	442	35
8-9A	1050	15	730	415	525	20	444	30
9-10A	885	10	700	380	313	50	298	20

	Ramp 10
6-7A	938
7-8A	1403
8-9A	1545
9-10A	1345

	I-495	
	EB	WB
6-7A	8050	3,643
7-8A	9730	3,294
8-9A	9738	2,814
9-10A	8371	2,470

	Exit 25						
	Ramp 1	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	305	354	330	335	482	897	330
7-8A	365	344	510	520	746	1160	370
8-9A	415	372	540	465	928	990	400
9-10A	380	357	405	330	806	661	365

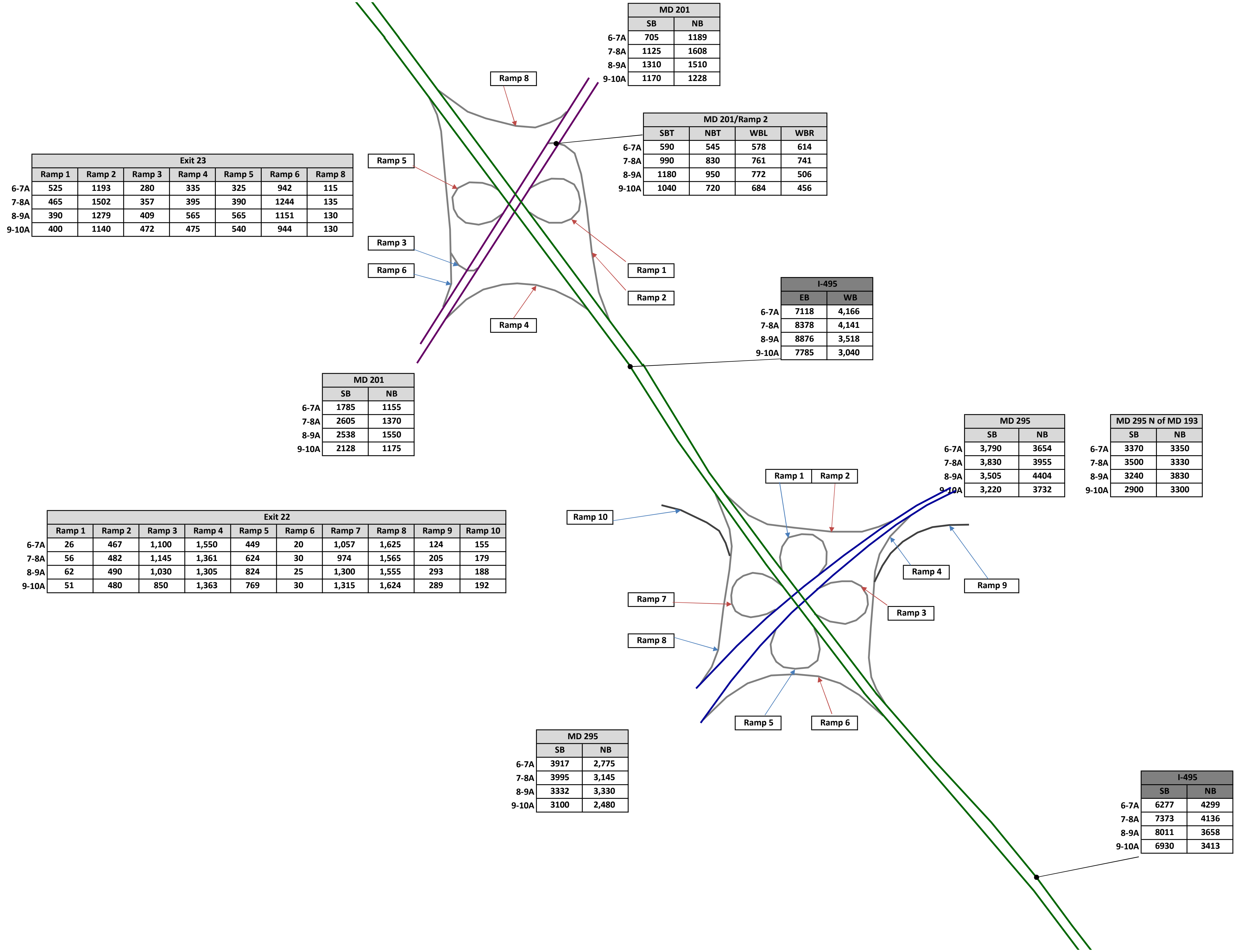
	US 1/Ramp 6/Edgewood Rd									
	SBU	SBL	SBT	NBT	NBR	WBL	WBR	EBL	EBT	EBR
6-7A	10	30	895	765	30	55	200	10	40	620
7-8A	5	80	1530	990	70	105	270	5	105	805
8-9A	10	70	675	1050	60	75	255	5	105	800
9-10A	20	130	370	935	65	50	180	0	125	665

	US 1	
	SB	NB
6-7A	1356	795
7-8A	2253	1060
8-9A	1551	1110
9-10A	1101	1000

	Greenbelt Commuter Station	
6-7A	370	30
7-8A	536	55
8-9A	432	55
9-10A	185	40

	I-495	
	EB	WB
6-7A	7680	3,613
7-8A	9194	3,239
8-9A	9305	2,759
9-10A	8165	2,430

I-495 Northeast Side AM
Existing Peak Period Volumes



	MD 201	
	SB	NB
6-7A	705	1189
7-8A	1125	1608
8-9A	1310	1510
9-10A	1170	1228

	MD 201/Ramp 2			
	SBT	NBT	WBL	WBR
6-7A	590	545	578	614
7-8A	990	830	761	741
8-9A	1180	950	772	506
9-10A	1040	720	684	456

	Exit 23						
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8
6-7A	525	1193	280	335	325	942	115
7-8A	465	1502	357	395	390	1244	135
8-9A	390	1279	409	565	565	1151	130
9-10A	400	1140	472	475	540	944	130

	I-495	
	EB	WB
6-7A	7118	4,166
7-8A	8378	4,141
8-9A	8876	3,518
9-10A	7785	3,040

	MD 201	
	SB	NB
6-7A	1785	1155
7-8A	2605	1370
8-9A	2538	1550
9-10A	2128	1175

	MD 295	
	SB	NB
6-7A	3,790	3654
7-8A	3,830	3955
8-9A	3,505	4404
9-10A	3,220	3732

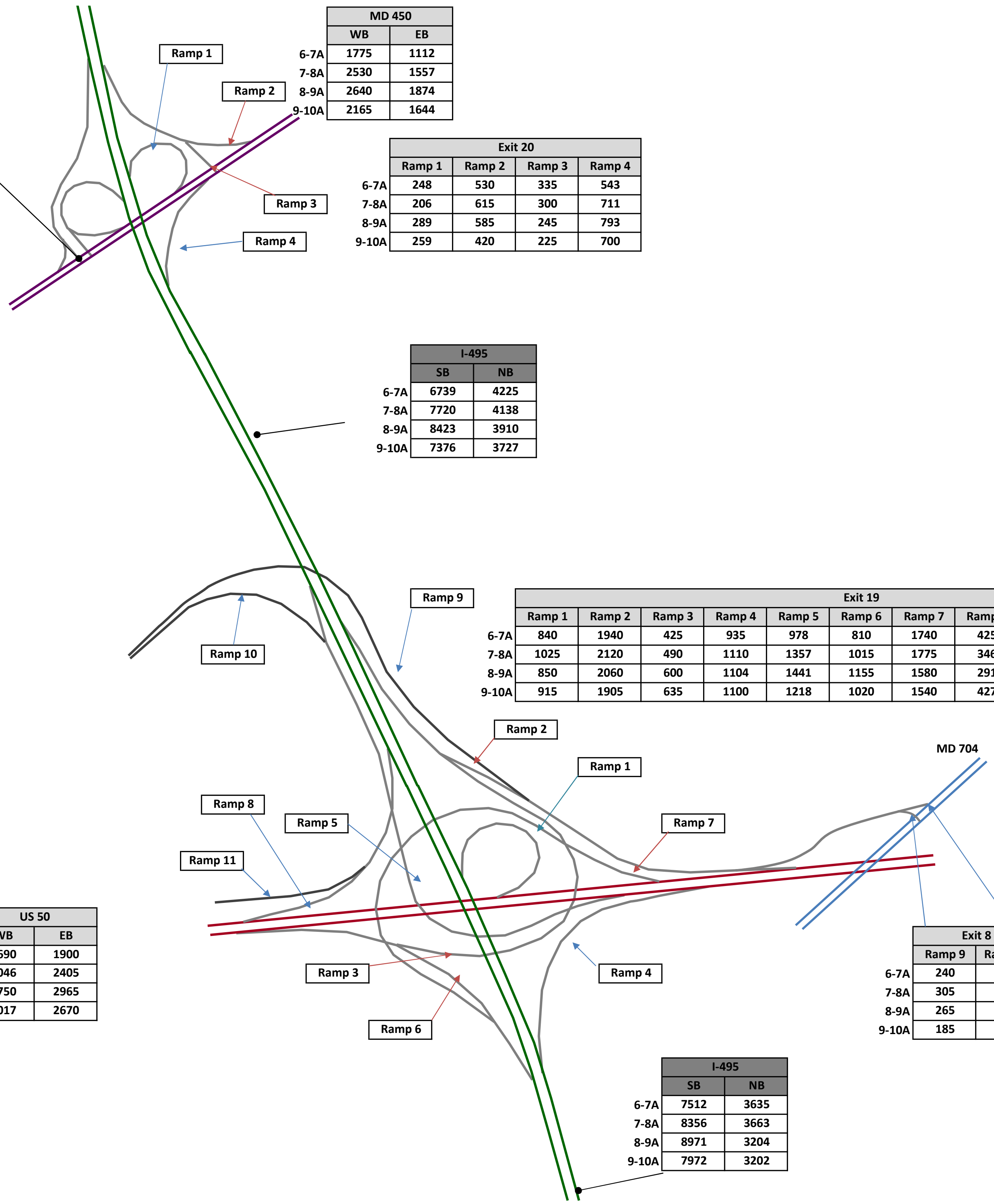
	MD 295 N of MD 193	
	SB	NB
6-7A	3370	3350
7-8A	3500	3330
8-9A	3240	3830
9-10A	2900	3300

	Exit 22									
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
6-7A	26	467	1,100	1,550	449	20	1,057	1,625	124	155
7-8A	56	482	1,145	1,361	624	30	974	1,565	205	179
8-9A	62	490	1,030	1,305	824	25	1,300	1,555	293	188
9-10A	51	480	850	1,363	769	30	1,315	1,624	289	192

	MD 295	
	SB	NB
6-7A	3917	2,775
7-8A	3995	3,145
8-9A	3332	3,330
9-10A	3100	2,480

	I-495	
	SB	NB
6-7A	6277	4299
7-8A	7373	4136
8-9A	8011	3658
9-10A	6930	3413

I-495 Northeast Side AM
Existing Peak Period Volumes



	Exit 20			
	Ramp 8	Ramp 5	Ramp 6	Ramp 7
6-7A	259	274	325	670
7-8A	412	341	350	750
8-9A	397	371	390	790
9-10A	248	321	325	690

	MD 450	
	WB	EB
6-7A	1775	1112
7-8A	2530	1557
8-9A	2640	1874
9-10A	2165	1644

	Exit 20			
	Ramp 1	Ramp 2	Ramp 3	Ramp 4
6-7A	248	530	335	543
7-8A	206	615	300	711
8-9A	289	585	245	793
9-10A	259	420	225	700

	MD 450	
	WB	EB
6-7A	1082	955
7-8A	1783	1155
8-9A	1951	1345
9-10A	1562	1140

	I-495	
	SB	NB
6-7A	6739	4225
7-8A	7720	4138
8-9A	8423	3910
9-10A	7376	3727

	Exit 19										
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10	Ramp 11
6-7A	840	1940	425	935	978	810	1740	425	560	15	374
7-8A	1025	2120	490	1110	1357	1015	1775	346	860	15	451
8-9A	850	2060	600	1104	1441	1155	1580	291	620	45	454
9-10A	915	1905	635	1100	1218	1020	1540	427	325	25	318

	US-50	
	WB	EB
6-7A	6980	2578
7-8A	7465	3367
8-9A	7015	3755
9-10A	5905	3333

	US 50	
	WB	EB
6-7A	4690	1900
7-8A	5046	2405
8-9A	4750	2965
9-10A	4017	2670

	Exit 8	
	Ramp 9	Ramp 10
6-7A	240	445
7-8A	305	660
8-9A	265	590
9-10A	185	355

	I-495	
	SB	NB
6-7A	7512	3635
7-8A	8356	3663
8-9A	8971	3204
9-10A	7972	3202

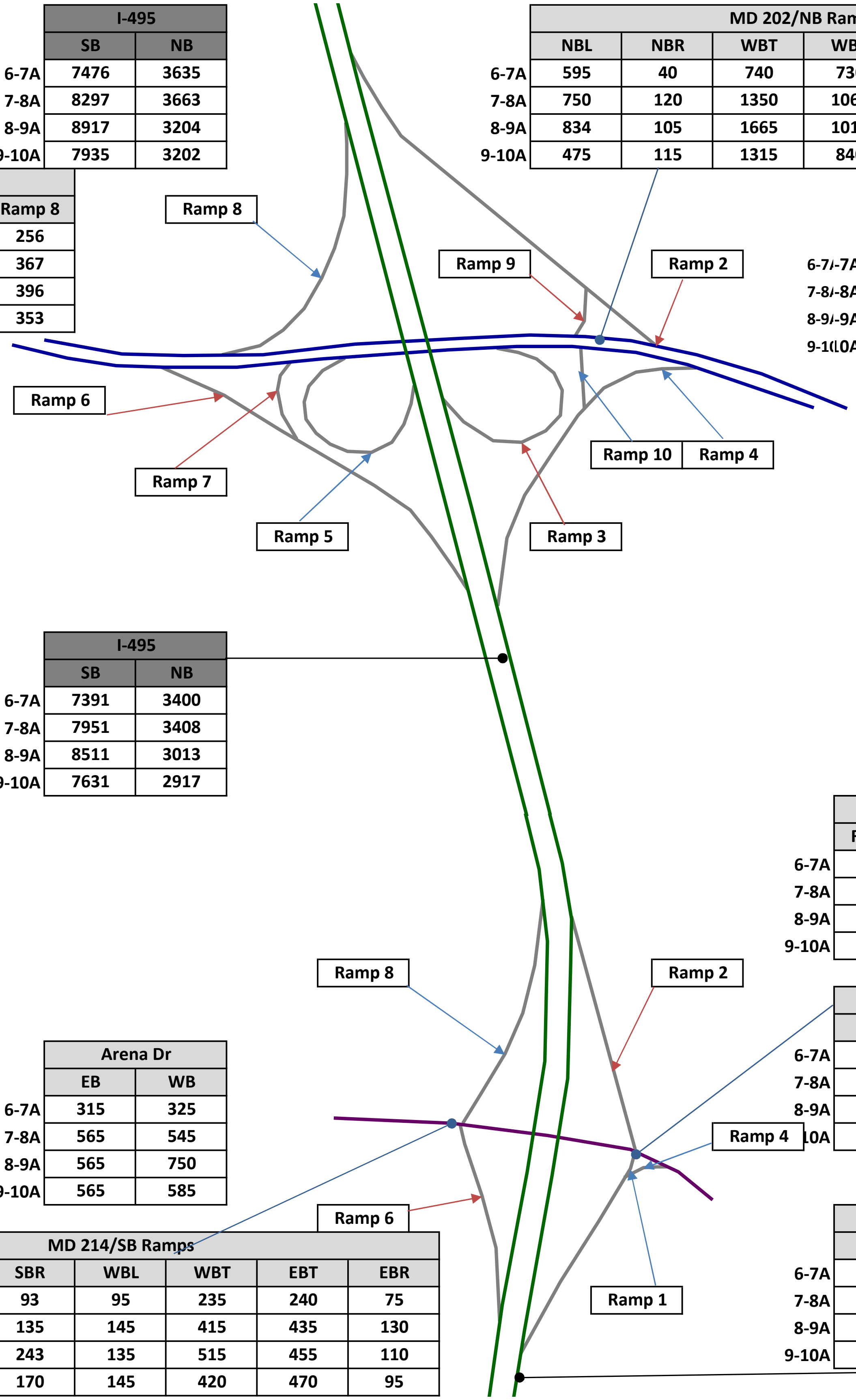
I-495 East Side AM
Existing Peak Period Volumes

I-495	SB	NB
6-7A	7476	3635
7-8A	8297	3663
8-9A	8917	3204
9-10A	7935	3202

MD 202/NB Ramps	NBL	NBR	WBT	WBR	EBL	EBT
6-7A	595	40	740	730	10	655
7-8A	750	120	1350	1060	15	1335
8-9A	834	105	1665	1015	5	1485
9-10A	475	115	1315	840	15	1290

Exit 17	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	348	340	145	256
7-8A	728	455	240	367
8-9A	973	595	320	396
9-10A	769	530	255	353

Exit 17	Ramp 2	Ramp 3	Ramp 4	Ramp 9	Ramp 10
6-7/-7A	730	170	40	10	635
7-8/-8A	1060	170	120	15	870
8-9/-9A	1015	215	105	5	939
9-1(10A	840	135	115	15	590



MD 202	EB	WB
6-7A	840	1346
7-8A	1275	2127
8-9A	1360	2575
9-10A	1225	1888

MD 202	EB	WB
6-7A	710	1370
7-8A	1488	2310
8-9A	1629	2680
9-10A	1433	2155

I-495	SB	NB
6-7A	7391	3400
7-8A	7951	3408
8-9A	8511	3013
9-10A	7631	2917

Exit 16	Ramp 1	Ramp 2	Ramp 4	Ramp 6	Ramp 8
6-7A	120	315	275	170	176
7-8A	150	425	340	275	239
8-9A	200	385	360	245	419
9-10A	145	365	195	240	330

MD 214/NB Ramps	NBL	NBT	NBR	WBT	WBR	EBL	EBT
6-7A	120	0	275	210	160	155	165
7-8A	150	0	340	410	225	200	335
8-9A	195	5	360	455	210	170	455
10A	145	0	195	420	180	185	440

Arena Dr	EB	WB
6-7A	315	325
7-8A	565	545
8-9A	565	750
9-10A	565	585

MD 214/SB Ramps	SBL	SBT	SBR	WBL	WBT	EBT	EBR
6-7A	83	0	93	95	235	240	75
7-8A	104	0	135	145	415	435	130
8-9A	176	0	243	135	515	455	110
9-10A	160	0	170	145	420	470	95

Arena Dr	EB	WB
6-7A	444	370
7-8A	680	635
8-9A	822	665
9-10A	641	600

I-495	SB	NB
6-7A	7353	3480
7-8A	7936	3473
8-9A	8292	3188
9-10A	7514	2892

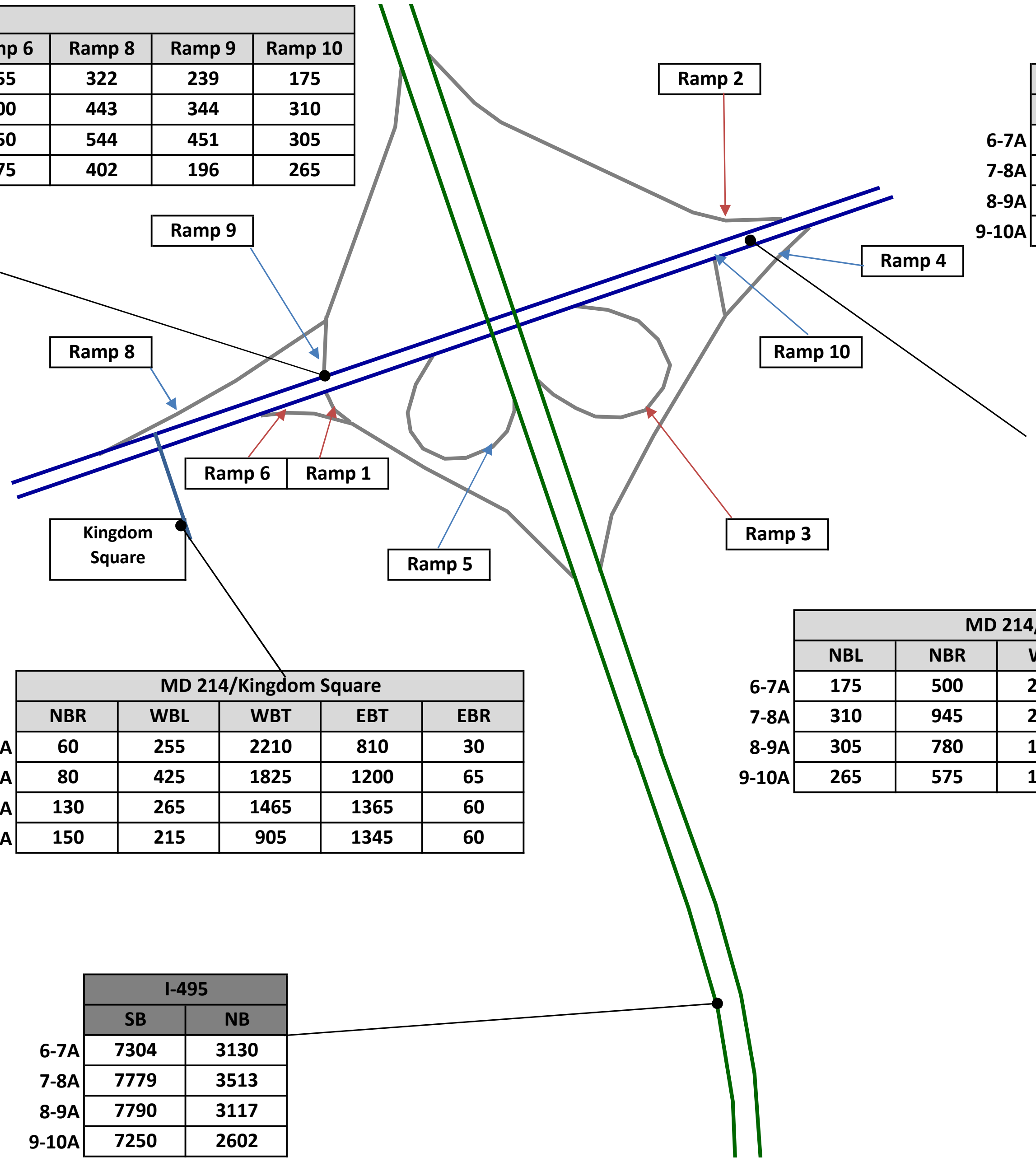
I-495 East Side AM
Existing Peak Period Volumes

	Exit 15								
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8	Ramp 9	Ramp 10
6-7A	690	545	480	500	463	255	322	239	175
7-8A	890	600	615	945	609	300	443	344	310
8-9A	790	525	630	779	689	350	544	451	305
9-10A	615	520	610	575	681	375	402	196	265

	MD 214/SB Ramps				
	SBR	WBL	WBT	EBT	EBR
6-7A	230	690	2235	585	255
7-8A	330	890	1920	965	300
8-9A	435	790	1295	1075	350
9-10A	190	615	930	1030	375

	MD 214	
	EB	WB
6-7A	1098	3295
7-8A	1919	3100
8-9A	1983	2305
9-10A	1766	1800

	MD 214	
	EB	WB
6-7A	840	2532
7-8A	1265	2268
8-9A	1425	2009
9-10A	1405	1307

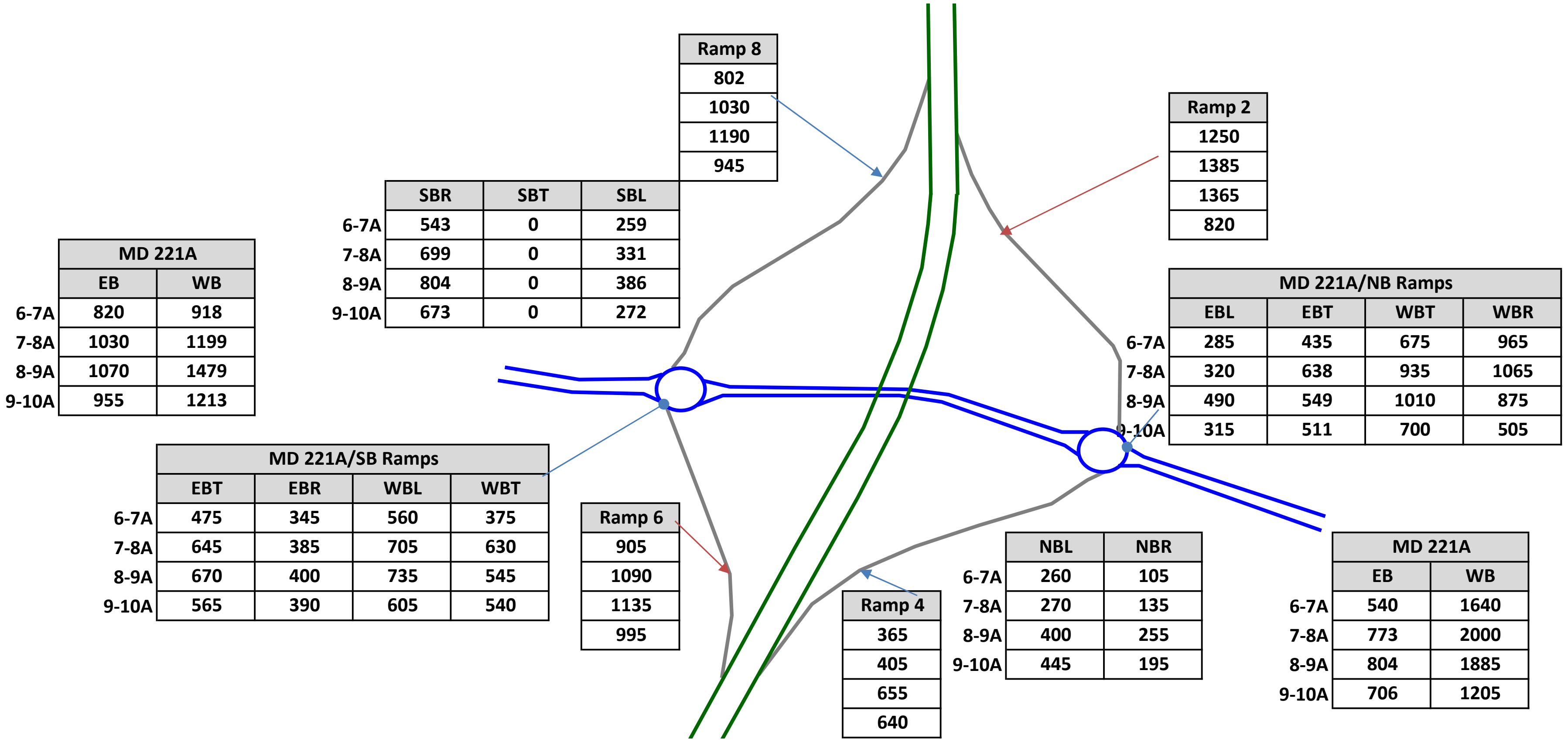


	MD 214/Kingdom Square				
	NBR	WBL	WBT	EBT	EBR
6-7A	60	255	2210	810	30
7-8A	80	425	1825	1200	65
8-9A	130	265	1465	1365	60
9-10A	150	215	905	1345	60

	MD 214/NB Ramps				
	NBL	NBR	WBT	WBR	EBT
6-7A	175	500	2750	545	550
7-8A	310	945	2500	600	935
8-9A	305	780	1780	525	1110
9-10A	265	575	1280	520	1080

	I-495	
	SB	NB
6-7A	7304	3130
7-8A	7779	3513
8-9A	7790	3117
9-10A	7250	2602

I-495 East Side AM
Existing Peak Period Volumes



Ramp 8
802
1030
1190
945

	SBR	SBT	SBL
6-7A	543	0	259
7-8A	699	0	331
8-9A	804	0	386
9-10A	673	0	272

Ramp 2
1250
1385
1365
820

	MD 221A	
	EB	WB
6-7A	820	918
7-8A	1030	1199
8-9A	1070	1479
9-10A	955	1213

	MD 221A/NB Ramps			
	EBL	EBT	WBT	WBR
6-7A	285	435	675	965
7-8A	320	638	935	1065
8-9A	490	549	1010	875
9-10A	315	511	700	505

	MD 221A/SB Ramps			
	EBT	EBR	WBL	WBT
6-7A	475	345	560	375
7-8A	645	385	705	630
8-9A	670	400	735	545
9-10A	565	390	605	540

Ramp 6
905
1090
1135
995

Ramp 4
365
405
655
640

	NBL	NBR
6-7A	260	105
7-8A	270	135
8-9A	400	255
9-10A	445	195

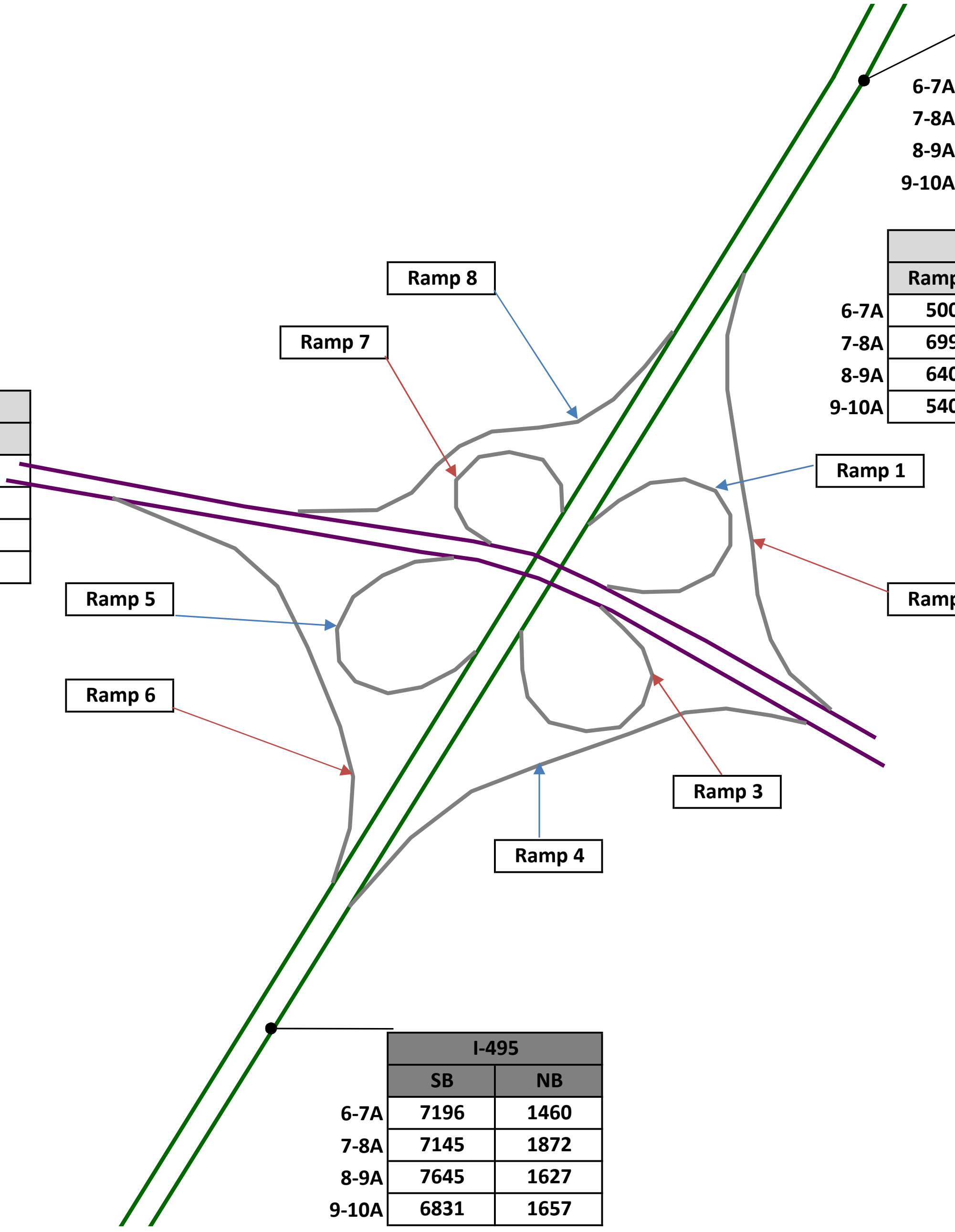
	MD 221A	
	EB	WB
6-7A	540	1640
7-8A	773	2000
8-9A	804	1885
9-10A	706	1205

I-495 East Side AM
Existing Peak Period Volumes

	I-495	
	SB	NB
6-7A	7407	2245
7-8A	7838	2533
8-9A	7735	2407
9-10A	7300	2422

	Exit 11							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	500	1260	515	490	760	455	1115	1008
7-8A	699	1205	605	450	661	425	815	1250
8-9A	640	1290	600	470	512	450	740	748
9-10A	540	1160	560	415	579	360	565	800

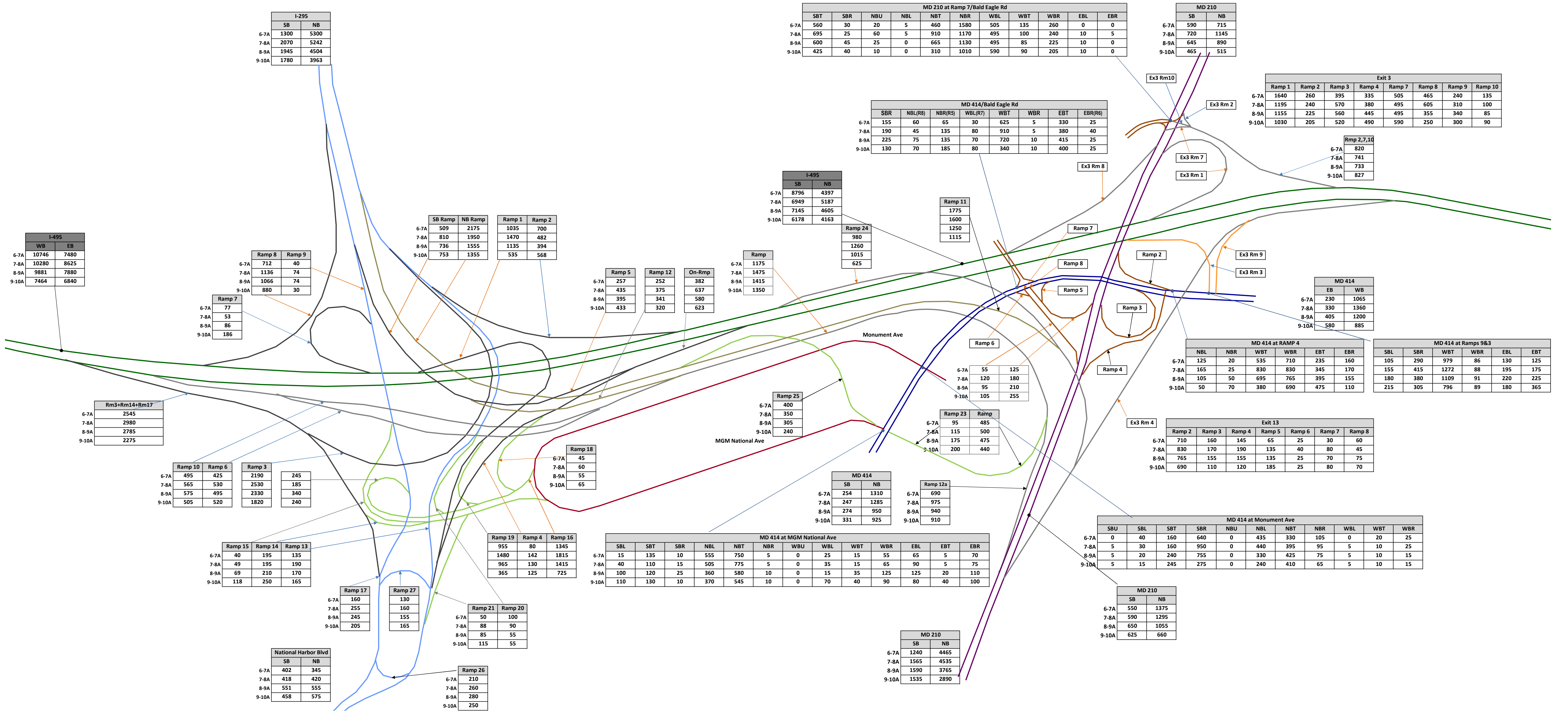
	MD 4	
	SB	NB
6-7A	1240	1863
7-8A	1540	2794
8-9A	1465	1963
9-10A	1345	1520



	MD 4	
	SB	NB
6-7A	1600	2730
7-8A	1705	2865
8-9A	1470	2605
9-10A	1495	1905

	I-495	
	SB	NB
6-7A	7196	1460
7-8A	7145	1872
8-9A	7645	1627
9-10A	6831	1657

I-495 South Side AM
Existing Peak Period Volumes



I-295	SB	NB
6-7A	1300	5300
7-8A	2070	5242
8-9A	1945	4504
9-10A	1780	3963

I-495	WB	EB
6-7A	10746	7480
7-8A	10280	8625
8-9A	9881	7880
9-10A	7464	6840

	Ramp 8	Ramp 9
6-7A	712	40
7-8A	1136	74
8-9A	1066	74
9-10A	880	30

	Ramp 7
6-7A	77
7-8A	53
8-9A	86
9-10A	186

	SB Ramp	NB Ramp
6-7A	509	2175
7-8A	810	1950
8-9A	736	1555
9-10A	753	1355

	Ramp 1	Ramp 2
6-7A	1035	700
7-8A	1470	482
8-9A	1135	394
9-10A	535	568

	Ramp 5
6-7A	257
7-8A	435
8-9A	395
9-10A	433

	Ramp 12
6-7A	252
7-8A	375
8-9A	341
9-10A	320

	On-Rmp
6-7A	382
7-8A	637
8-9A	580
9-10A	623

	Ramp
6-7A	1175
7-8A	1475
8-9A	1415
9-10A	1350

I-495	SB	NB
6-7A	8796	4397
7-8A	6949	5187
8-9A	7145	4605
9-10A	6178	4163

Ramp 24
980
1260
1015
625

Ramp 11
1775
1600
1250
1115

MD 210 at Ramp 7/Bald Eagle Rd	SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBR
6-7A	560	30	20	5	460	1580	505	135	260	0	0
7-8A	695	25	60	5	910	1170	495	100	240	10	5
8-9A	600	45	25	0	665	1130	495	85	225	10	0
9-10A	425	40	10	0	310	1010	590	90	205	10	0

MD 414/Bald Eagle Rd	SBR	NBL(R8)	NBR(R5)	WBL(R7)	WBT	WBR	EBT	EBR(R6)
6-7A	155	60	65	30	625	5	330	25
7-8A	190	45	135	80	910	5	380	40
8-9A	225	75	135	70	720	10	415	25
9-10A	130	70	185	80	340	10	400	25

MD 210	SB	NB
6-7A	590	715
7-8A	720	1145
8-9A	645	890
9-10A	465	515

Exit 3	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 7	Ramp 8	Ramp 9	Ramp 10
6-7A	1640	260	395	335	505	465	240	135
7-8A	1195	240	570	380	495	605	310	100
8-9A	1155	225	560	445	495	355	340	85
9-10A	1030	205	520	490	590	250	300	90

	Rmp 2,7,10
6-7A	820
7-8A	741
8-9A	733
9-10A	827

MD 414	EB	WB
6-7A	230	1065
7-8A	330	1360
8-9A	405	1200
9-10A	580	885

MD 414 at RAMP 4	NBL	NBR	WBT	WBR	EBT	EBR
6-7A	125	20	535	710	235	160
7-8A	165	25	830	830	345	170
8-9A	105	50	695	765	395	155
9-10A	50	70	380	690	475	110

MD 414 at Ramps 9&3	SBL	SBR	WBT	WBR	EBL	EBT
	105	290	979	86	130	125
	155	415	1272	88	195	175
	180	380	1109	91	220	225
	215	305	796	89	180	365

6-7A	55	125
7-8A	120	180
8-9A	95	210
9-10A	105	255

Exit 13	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	710	160	145	65	25	30	60
7-8A	830	170	190	135	40	80	45
8-9A	765	155	155	135	25	70	75
9-10A	690	110	120	185	25	80	70

	Ramp 25
6-7A	400
7-8A	350
8-9A	305
9-10A	240

	Ramp 23	Ramp
6-7A	95	485
7-8A	115	500
8-9A	175	475
9-10A	200	440

Rm3+Rm14+Rm17	
6-7A	2545
7-8A	2980
8-9A	2785
9-10A	2275

	Ramp 10	Ramp 6
6-7A	495	425
7-8A	565	530
8-9A	575	495
9-10A	505	520

Ramp 3
2190
2530
2330
1820

245
185
340
240

	Ramp 18
6-7A	45
7-8A	60
8-9A	55
9-10A	65

	Ramp 15	Ramp 14	Ramp 13
6-7A	40	195	135
7-8A	49	195	190
8-9A	69	210	170
9-10A	118	250	165

Ramp 19	Ramp 4	Ramp 16
955	80	1345
1480	142	1815
965	130	1415
365	125	725

	Ramp 17
6-7A	160
7-8A	255
8-9A	245
9-10A	205

Ramp 27
130
160
155
165

	Ramp 21	Ramp 20
6-7A	50	100
7-8A	88	90
8-9A	85	55
9-10A	115	55

National Harbor Blvd	SB	NB
6-7A	402	345
7-8A	418	420
8-9A	551	555
9-10A	458	575

	Ramp 26
6-7A	210
7-8A	260
8-9A	280
9-10A	250

MD 414	SB	NB
6-7A	254	1310
7-8A	247	1285
8-9A	274	950
9-10A	331	925

	Ramp 12a
6-7A	690
7-8A	975
8-9A	940
9-10A	910

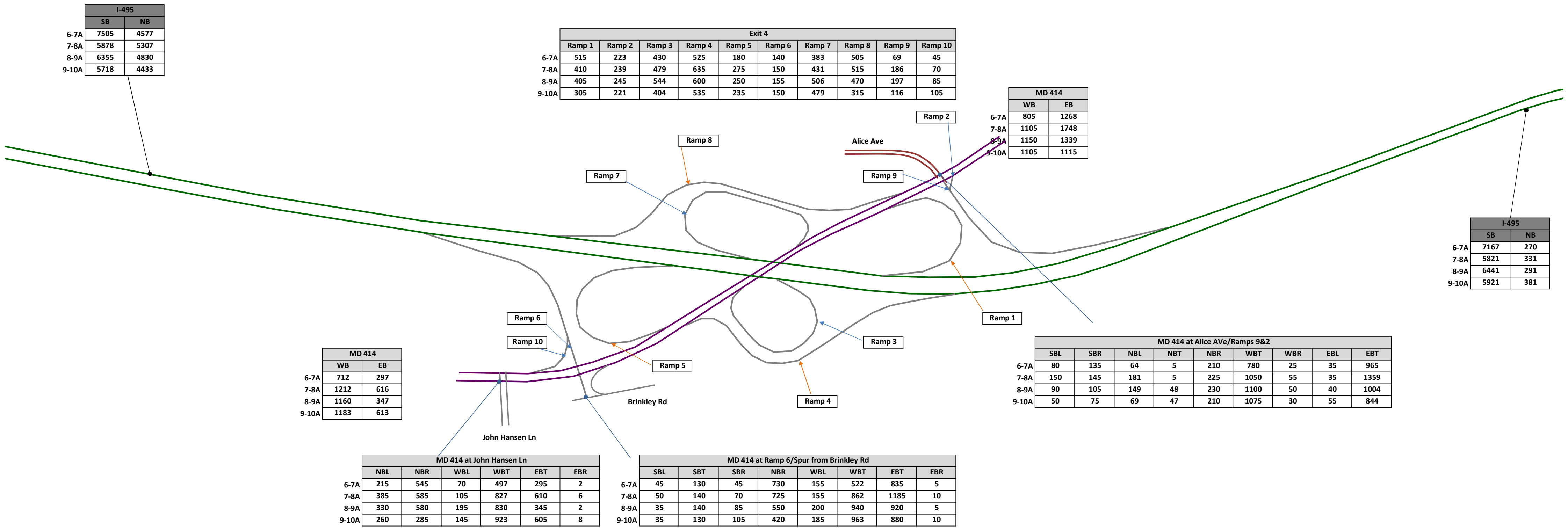
MD 414 at MGM National Ave	SBL	SBT	SBR	NBL	NBT	NBR	WBU	WBL	WBT	WBR	EBL	EBT	EBR
6-7A	15	135	10	555	750	5	0	25	15	55	65	5	70
7-8A	40	110	15	505	775	5	0	35	15	65	90	5	75
8-9A	100	120	25	360	580	10	0	15	35	125	125	20	110
9-10A	110	130	10	370	545	10	0	70	40	90	80	40	100

MD 414 at Monument Ave	SBU	SBL	SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR
6-7A	0	40	160	640	0	435	330	105	0	20	25
7-8A	5	30	160	950	0	440	395	95	5	10	25
8-9A	5	20	240	755	0	330	425	75	5	10	15
9-10A	5	15	245	275	0	240	410	65	5	10	15

MD 210	SB	NB
6-7A	550	1375
7-8A	590	1295
8-9A	650	1055
9-10A	625	660

MD 210	SB	NB
6-7A	1240	4465
7-8A	1565	4535
8-9A	1590	3765
9-10A	1535	2890

I-495 South Side AM
Existing Peak Period Volumes



	I-495	
	SB	NB
6-7A	7505	4577
7-8A	5878	5307
8-9A	6355	4830
9-10A	5718	4433

	Exit 4									
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
6-7A	515	223	430	525	180	140	383	505	69	45
7-8A	410	239	479	635	275	150	431	515	186	70
8-9A	405	245	544	600	250	155	506	470	197	85
9-10A	305	221	404	535	235	150	479	315	116	105

	MD 414	
	WB	EB
6-7A	805	1268
7-8A	1105	1748
8-9A	1150	1339
9-10A	1105	1115

	I-495	
	SB	NB
6-7A	7167	270
7-8A	5821	331
8-9A	6441	291
9-10A	5921	381

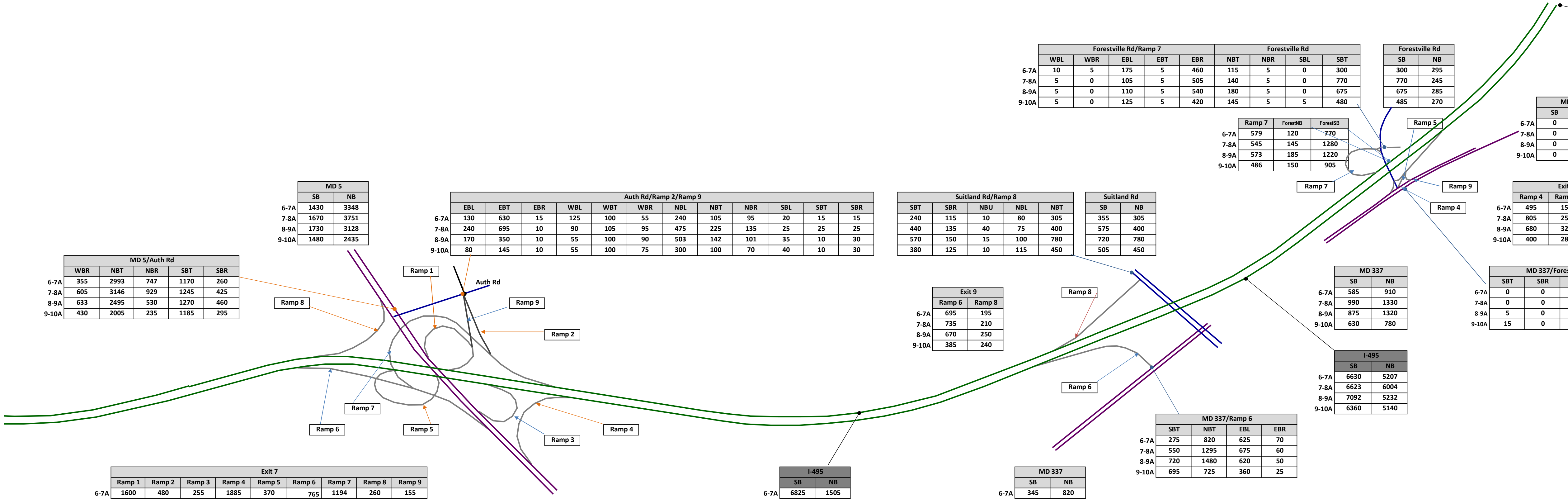
	MD 414 at Alice AVe/Ramps 9&2								
	SBL	SBR	NBL	NBT	NBR	WBT	WBR	EBL	EBT
6-7A	80	135	64	5	210	780	25	35	965
7-8A	150	145	181	5	225	1050	55	35	1359
8-9A	90	105	149	48	230	1100	50	40	1004
9-10A	50	75	69	47	210	1075	30	55	844

	MD 414	
	WB	EB
6-7A	712	297
7-8A	1212	616
8-9A	1160	347
9-10A	1183	613

	MD 414 at John Hansen Ln					
	NBL	NBR	WBL	WBT	EBT	EBR
6-7A	215	545	70	497	295	2
7-8A	385	585	105	827	610	6
8-9A	330	580	195	830	345	2
9-10A	260	285	145	923	605	8

	MD 414 at Ramp 6/Spur from Brinkley Rd							
	SBL	SBT	SBR	NBR	WBL	WBT	EBT	EBR
6-7A	45	130	45	730	155	522	835	5
7-8A	50	140	70	725	155	862	1185	10
8-9A	35	140	85	550	200	940	920	5
9-10A	35	130	105	420	185	963	880	10

I-495 South Side AM
Existing Peak Period Volumes



	I-495	
	SB	NB
6-7A	7209	1460
7-8A	7168	1872
8-9A	7665	1627
9-10A	6846	1657

	Forestville Rd/Ramp 7					Forestville Rd			
	WBL	WBR	EBL	EBT	EBR	NBT	NBR	SBL	SBT
6-7A	10	5	175	5	460	115	5	0	300
7-8A	5	0	105	5	505	140	5	0	770
8-9A	5	0	110	5	540	180	5	0	675
9-10A	5	0	125	5	420	145	5	5	480

Forestville Rd	
SB	NB
300	295
770	245
675	285
485	270

	MD 337	
	SB	NB
6-7A	0	325
7-8A	0	420
8-9A	0	485
9-10A	0	240

	Ramp 7	ForestNB	ForestSB
6-7A	579	120	770
7-8A	545	145	1280
8-9A	573	185	1220
9-10A	486	150	905

	Exit 9		
	Ramp 4	Ramp 5	Ramp 9
6-7A	495	155	0
7-8A	805	250	0
8-9A	680	320	0
9-10A	400	280	0

	MD 5	
	SB	NB
6-7A	1430	3348
7-8A	1670	3751
8-9A	1730	3128
9-10A	1480	2435

	Auth Rd/Ramp 2/Ramp 9											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
6-7A	130	630	15	125	100	55	240	105	95	20	15	15
7-8A	240	695	10	90	105	95	475	225	135	25	25	25
8-9A	170	350	10	55	100	90	503	142	101	35	10	30
9-10A	80	145	10	55	100	75	300	100	70	40	10	30

Suitland Rd/Ramp 8				
SBT	SBR	NBU	NBL	NBT
240	115	10	80	305
440	135	40	75	400
570	150	15	100	780
380	125	10	115	450

Suitland Rd	
SB	NB
355	305
575	400
720	780
505	450

	MD 5/Auth Rd				
	WBR	NBT	NBR	SBT	SBR
6-7A	355	2993	747	1170	260
7-8A	605	3146	929	1245	425
8-9A	633	2495	530	1270	460
9-10A	430	2005	235	1185	295

	MD 337	
	SB	NB
6-7A	585	910
7-8A	990	1330
8-9A	875	1320
9-10A	630	780

	MD 337/Forestville Rd				Forestville Rd	
	SBT	SBR	NBL	NBT	EBL	EBR
6-7A	0	0	615	295	30	585
7-8A	0	0	950	380	40	990
8-9A	5	0	865	455	30	870
9-10A	15	0	550	230	10	615

	Exit 9	
	Ramp 6	Ramp 8
6-7A	695	195
7-8A	735	210
8-9A	670	250
9-10A	385	240

	I-495	
	SB	NB
6-7A	6630	5207
7-8A	6623	6004
8-9A	7092	5232
9-10A	6360	5140

	MD 337/Ramp 6			
	SBT	NBT	EBL	EBR
6-7A	275	820	625	70
7-8A	550	1295	675	60
8-9A	720	1480	620	50
9-10A	695	725	360	25

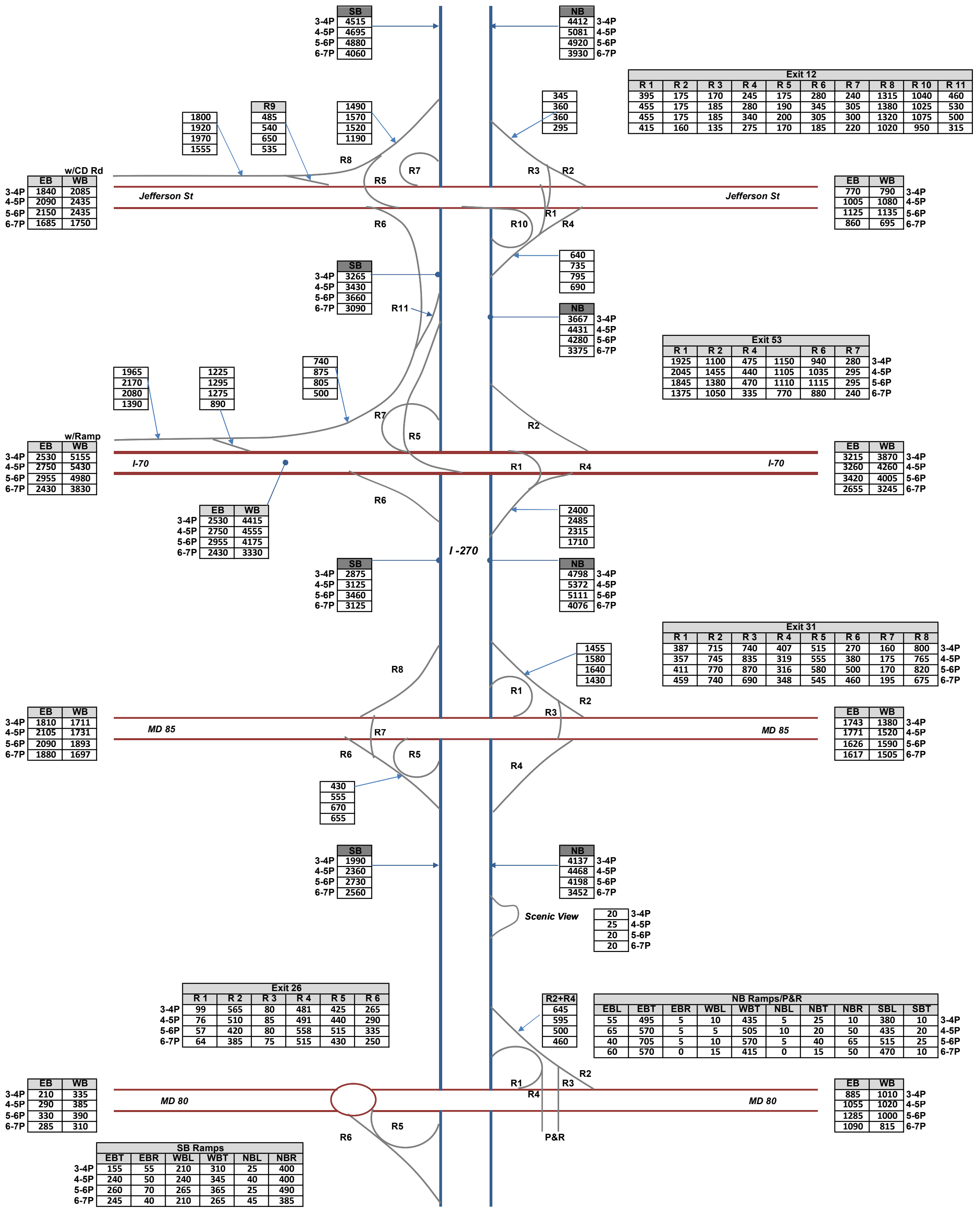
	Exit 7								
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9
6-7A	1600	480	255	1885	370	765	1194	260	155
7-8A	950	906	365	2050	435	899	1606	425	125
8-9A	845	792	360	1840	400	874	1489	460	75
9-10A	785	501	295	1755	395	874	1333	295	75

	I-495	
	SB	NB
6-7A	6825	1505
7-8A	6833	1552
8-9A	7342	1297
9-10A	6600	1362

	MD 337	
	SB	NB
6-7A	345	820
7-8A	610	1295
8-9A	770	1480
9-10A	720	725

	MD 5	
	SB	NB
6-7A	2759	6970
7-8A	3315	6710
8-9A	3233	5350
9-10A	2997	4485

I-270 & I-495 West Side PM Peak Period Existing Volumes



	SB
3-4P	4515
4-5P	4695
5-6P	4880
6-7P	4060

NB	
4412	3-4P
5081	4-5P
4920	5-6P
3930	6-7P

Exit 12									
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 10	R 11
395	175	170	245	175	280	240	1315	1040	460
455	175	185	280	190	345	305	1380	1025	530
455	175	185	340	200	305	300	1320	1075	500
415	160	135	275	170	185	220	1020	950	315

1800
1920
1970
1555

R9
485
540
650
535

1490
1570
1520
1190

345
360
360
295

w/CD Rd

	EB	WB
3-4P	1840	2085
4-5P	2090	2435
5-6P	2150	2435
6-7P	1685	1750

EB	WB	
770	790	3-4P
1005	1080	4-5P
1125	1135	5-6P
860	695	6-7P

640
735
795
690

	SB
3-4P	3265
4-5P	3430
5-6P	3660
6-7P	3090

NB	
3667	3-4P
4431	4-5P
4280	5-6P
3375	6-7P

Exit 53						
R 1	R 2	R 4		R 6	R 7	
1925	1100	475	1150	940	280	3-4P
2045	1455	440	1105	1035	295	4-5P
1845	1380	470	1110	1115	295	5-6P
1375	1050	335	770	880	240	6-7P

1965
2170
2080
1390

1225
1295
1275
890

740
875
805
500

w/Ramp

	EB	WB
3-4P	2530	5155
4-5P	2750	5430
5-6P	2955	4980
6-7P	2430	3830

EB	WB	
3215	3870	3-4P
3260	4260	4-5P
3420	4005	5-6P
2655	3245	6-7P

	EB	WB
3-4P	2530	4415
4-5P	2750	4555
5-6P	2955	4175
6-7P	2430	3330

2400
2485
2315
1710

	SB
3-4P	2875
4-5P	3125
5-6P	3460
6-7P	3125

NB	
4798	3-4P
5372	4-5P
5111	5-6P
4076	6-7P

Exit 31								
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	
387	715	740	407	515	270	160	800	3-4P
357	745	835	319	555	380	175	765	4-5P
411	770	870	316	580	500	170	820	5-6P
459	740	690	348	545	460	195	675	6-7P

1455
1580
1640
1430

	EB	WB
3-4P	1810	1711
4-5P	2105	1731
5-6P	2090	1893
6-7P	1880	1697

EB	WB	
1743	1380	3-4P
1771	1520	4-5P
1626	1590	5-6P
1617	1505	6-7P

430
555
670
655

	SB
3-4P	1990
4-5P	2360
5-6P	2730
6-7P	2560

NB	
4137	3-4P
4468	4-5P
4198	5-6P
3452	6-7P

Scenic View

20	3-4P
25	4-5P
20	5-6P
20	6-7P

	Exit 26					
	R 1	R 2	R 3	R 4	R 5	R 6
3-4P	99	565	80	481	425	265
4-5P	76	510	85	491	440	290
5-6P	57	420	80	558	515	335
6-7P	64	385	75	515	430	250

R2+R4
645
595
500
460

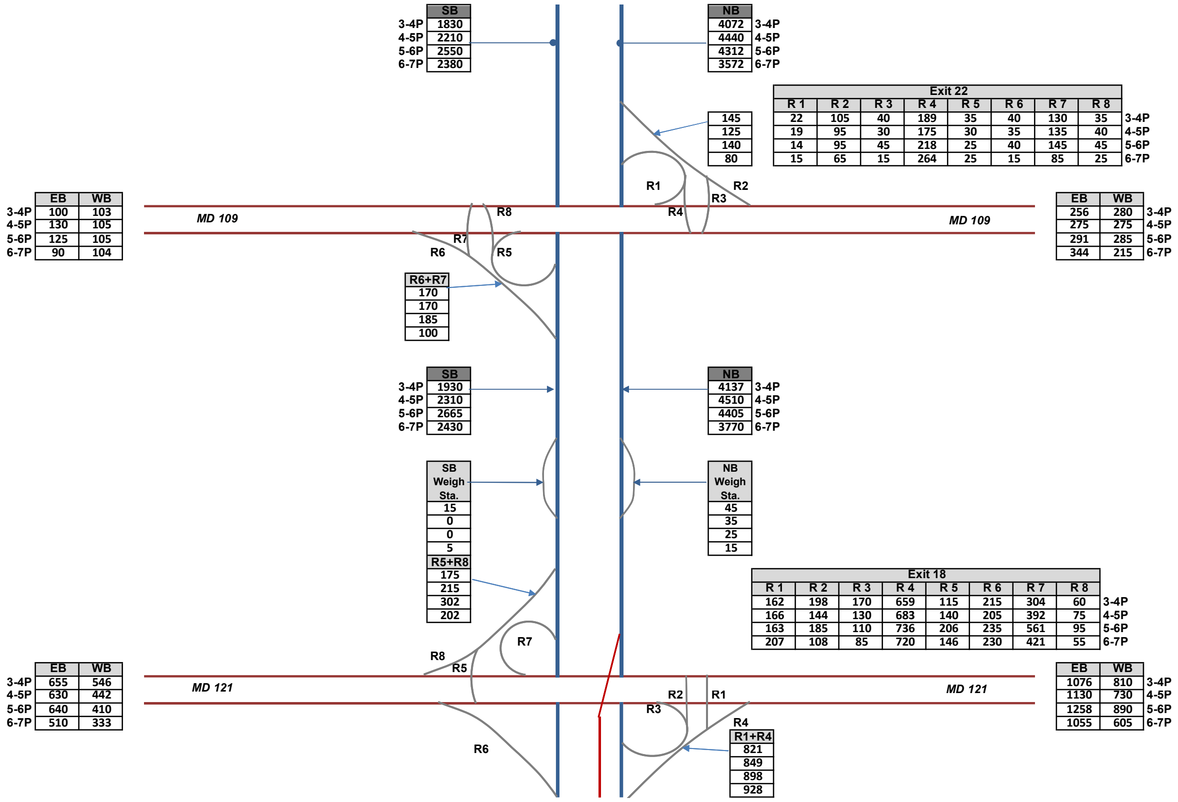
NB Ramps/P&R										
EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	
55	495	5	10	435	5	25	10	380	10	3-4P
65	570	5	5	505	10	20	50	435	20	4-5P
40	705	5	10	570	5	40	65	515	25	5-6P
60	570	0	15	415	0	15	50	470	10	6-7P

	EB	WB
3-4P	210	335
4-5P	290	385
5-6P	330	390
6-7P	285	310

EB	WB	
885	1010	3-4P
1055	1020	4-5P
1285	1000	5-6P
1090	815	6-7P

	SB Ramps					
	EBT	EBR	WBL	WBT	NBL	NBR
3-4P	155	55	210	310	25	400
4-5P	240	50	240	345	40	400
5-6P	260	70	265	365	25	490
6-7P	245	40	210	265	45	385

I-270 & I-495 West Side PM
Peak Period Existing Volumes



	SB
3-4P	1830
4-5P	2210
5-6P	2550
6-7P	2380

NB	
4072	3-4P
4440	4-5P
4312	5-6P
3572	6-7P

145
125
140
80

Exit 22								
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	
22	105	40	189	35	40	130	35	3-4P
19	95	30	175	30	35	135	40	4-5P
14	95	45	218	25	40	145	45	5-6P
15	65	15	264	25	15	85	25	6-7P

	EB	WB
3-4P	100	103
4-5P	130	105
5-6P	125	105
6-7P	90	104

EB	WB	
256	280	3-4P
275	275	4-5P
291	285	5-6P
344	215	6-7P

R6+R7
170
170
185
100

	SB
3-4P	1930
4-5P	2310
5-6P	2665
6-7P	2430

NB	
4137	3-4P
4510	4-5P
4405	5-6P
3770	6-7P

SB Weigh Sta.
15
0
0
5

NB Weigh Sta.
45
35
25
15

R5+R8
175
215
302
202

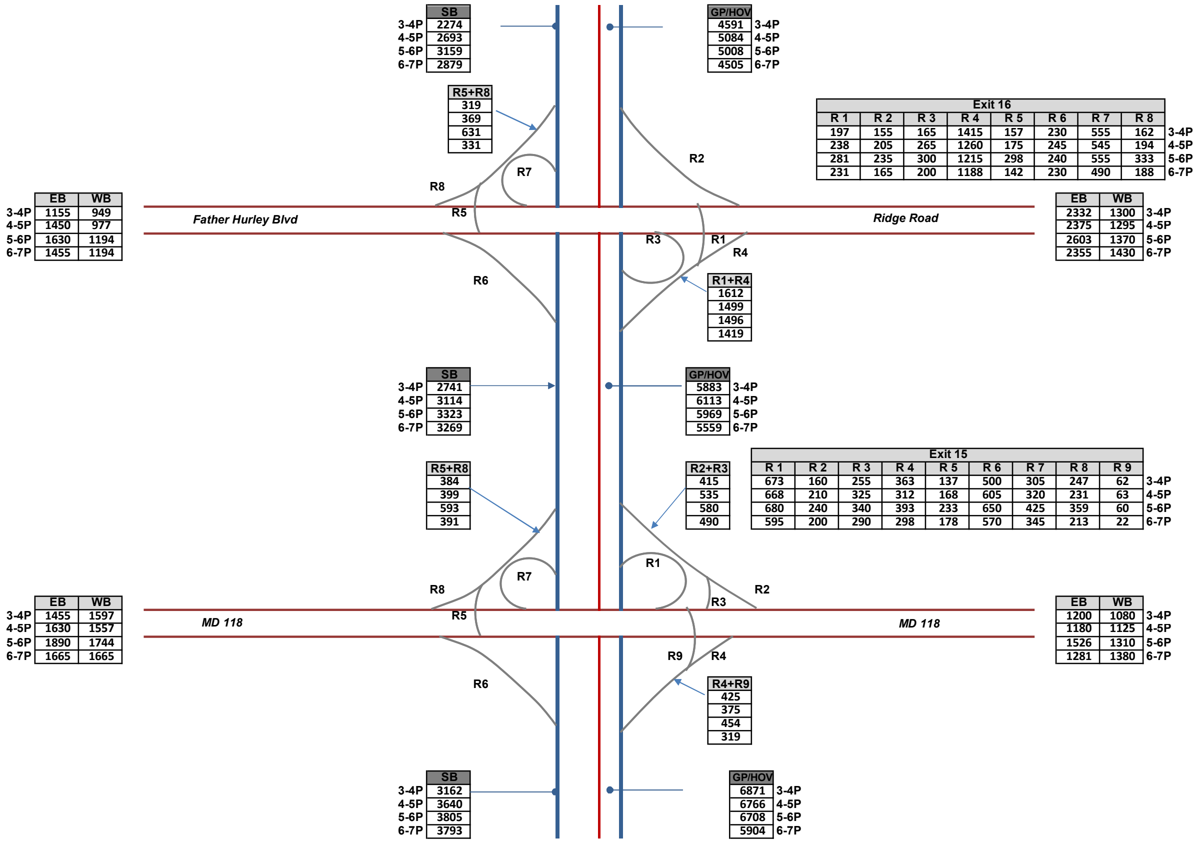
Exit 18								
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	
162	198	170	659	115	215	304	60	3-4P
166	144	130	683	140	205	392	75	4-5P
163	185	110	736	206	235	561	95	5-6P
207	108	85	720	146	230	421	55	6-7P

	EB	WB
3-4P	655	546
4-5P	630	442
5-6P	640	410
6-7P	510	333

EB	WB	
1076	810	3-4P
1130	730	4-5P
1258	890	5-6P
1055	605	6-7P

R1+R4
821
849
898
928

I-270 & I-495 West Side PM
Peak Period Existing Volumes



	SB
3-4P	2274
4-5P	2693
5-6P	3159
6-7P	2879

GP/HOV	
4591	3-4P
5084	4-5P
5008	5-6P
4505	6-7P

R5+R8
319
369
631
331

Exit 16								
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	
197	155	165	1415	157	230	555	162	3-4P
238	205	265	1260	175	245	545	194	4-5P
281	235	300	1215	298	240	555	333	5-6P
231	165	200	1188	142	230	490	188	6-7P

	EB	WB
3-4P	1155	949
4-5P	1450	977
5-6P	1630	1194
6-7P	1455	1194

EB	WB	
2332	1300	3-4P
2375	1295	4-5P
2603	1370	5-6P
2355	1430	6-7P

R1+R4
1612
1499
1496
1419

	SB
3-4P	2741
4-5P	3114
5-6P	3323
6-7P	3269

GP/HOV	
5883	3-4P
6113	4-5P
5969	5-6P
5559	6-7P

R5+R8
384
399
593
391

R2+R3
415
535
580
490

Exit 15									
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	
673	160	255	363	137	500	305	247	62	3-4P
668	210	325	312	168	605	320	231	63	4-5P
680	240	340	393	233	650	425	359	60	5-6P
595	200	290	298	178	570	345	213	22	6-7P

	EB	WB
3-4P	1455	1597
4-5P	1630	1557
5-6P	1890	1744
6-7P	1665	1665

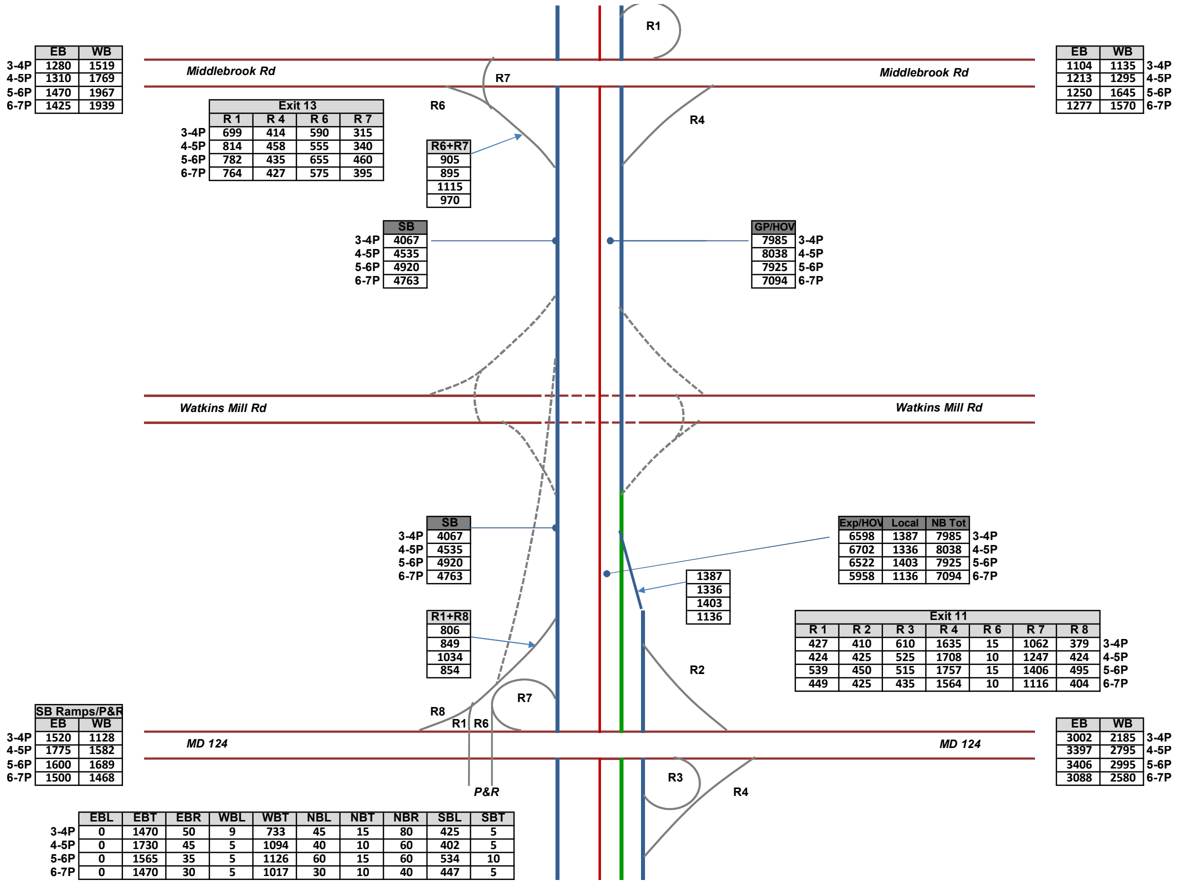
EB	WB	
1200	1080	3-4P
1180	1125	4-5P
1526	1310	5-6P
1281	1380	6-7P

R4+R9
425
375
454
319

	SB
3-4P	3162
4-5P	3640
5-6P	3805
6-7P	3793

GP/HOV	
6871	3-4P
6766	4-5P
6708	5-6P
5904	6-7P

I-270 & I-495 West Side PM
Peak Period Existing Volumes



	EB	WB
3-4P	1280	1519
4-5P	1310	1769
5-6P	1470	1967
6-7P	1425	1939

EB	WB	
1104	1135	3-4P
1213	1295	4-5P
1250	1645	5-6P
1277	1570	6-7P

	Exit 13			
	R 1	R 4	R 6	R 7
3-4P	699	414	590	315
4-5P	814	458	555	340
5-6P	782	435	655	460
6-7P	764	427	575	395

R6+R7
905
895
1115
970

	SB
3-4P	4067
4-5P	4535
5-6P	4920
6-7P	4763

GP/HOV	
7985	3-4P
8038	4-5P
7925	5-6P
7094	6-7P

	SB
3-4P	4067
4-5P	4535
5-6P	4920
6-7P	4763

Exp/HOV	Local	NB Tot	
6598	1387	7985	3-4P
6702	1336	8038	4-5P
6522	1403	7925	5-6P
5958	1136	7094	6-7P

1387
1336
1403
1136

R1+R8
806
849
1034
854

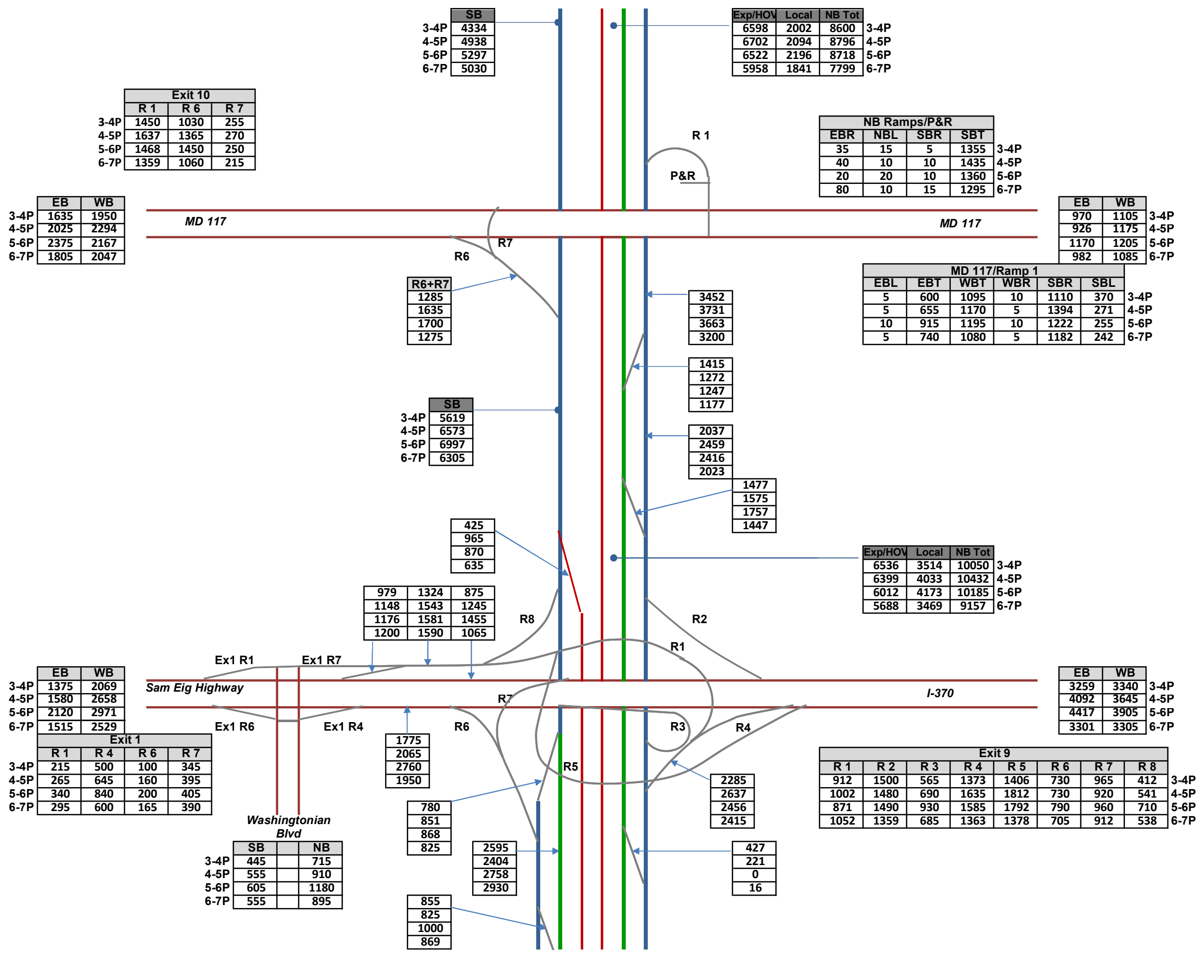
Exit 11							
R 1	R 2	R 3	R 4	R 6	R 7	R 8	
427	410	610	1635	15	1062	379	3-4P
424	425	525	1708	10	1247	424	4-5P
539	450	515	1757	15	1406	495	5-6P
449	425	435	1564	10	1116	404	6-7P

	SB Ramps/P&R	
	EB	WB
3-4P	1520	1128
4-5P	1775	1582
5-6P	1600	1689
6-7P	1500	1468

EB	WB	
3002	2185	3-4P
3397	2795	4-5P
3406	2995	5-6P
3088	2580	6-7P

	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
3-4P	0	1470	50	9	733	45	15	80	425	5
4-5P	0	1730	45	5	1094	40	10	60	402	5
5-6P	0	1565	35	5	1126	60	15	60	534	10
6-7P	0	1470	30	5	1017	30	10	40	447	5

I-270 & I-495 West Side PM
Peak Period Existing Volumes



	SB
3-4P	4334
4-5P	4938
5-6P	5297
6-7P	5030

Exp/HOV	Local	NB Tot	
6598	2002	8600	3-4P
6702	2094	8796	4-5P
6522	2196	8718	5-6P
5958	1841	7799	6-7P

	Exit 10		
	R 1	R 6	R 7
3-4P	1450	1030	255
4-5P	1637	1365	270
5-6P	1468	1450	250
6-7P	1359	1060	215

NB Ramps/P&R				
EBR	NBL	SBR	SBT	
35	15	5	1355	3-4P
40	10	10	1435	4-5P
20	20	10	1360	5-6P
80	10	15	1295	6-7P

	EB	WB
3-4P	1635	1950
4-5P	2025	2294
5-6P	2375	2167
6-7P	1805	2047

EB	WB	
970	1105	3-4P
926	1175	4-5P
1170	1205	5-6P
982	1085	6-7P

MD 117/Ramp 1						
EBL	EBT	WBT	WBR	SBR	SBL	
5	600	1095	10	1110	370	3-4P
5	655	1170	5	1394	271	4-5P
10	915	1195	10	1222	255	5-6P
5	740	1080	5	1182	242	6-7P

	SB
3-4P	5619
4-5P	6573
5-6P	6997
6-7P	6305

Exp/HOV	Local	NB Tot	
6536	3514	10050	3-4P
6399	4033	10432	4-5P
6012	4173	10185	5-6P
5688	3469	9157	6-7P

	EB	WB
3-4P	1375	2069
4-5P	1580	2658
5-6P	2120	2971
6-7P	1515	2529

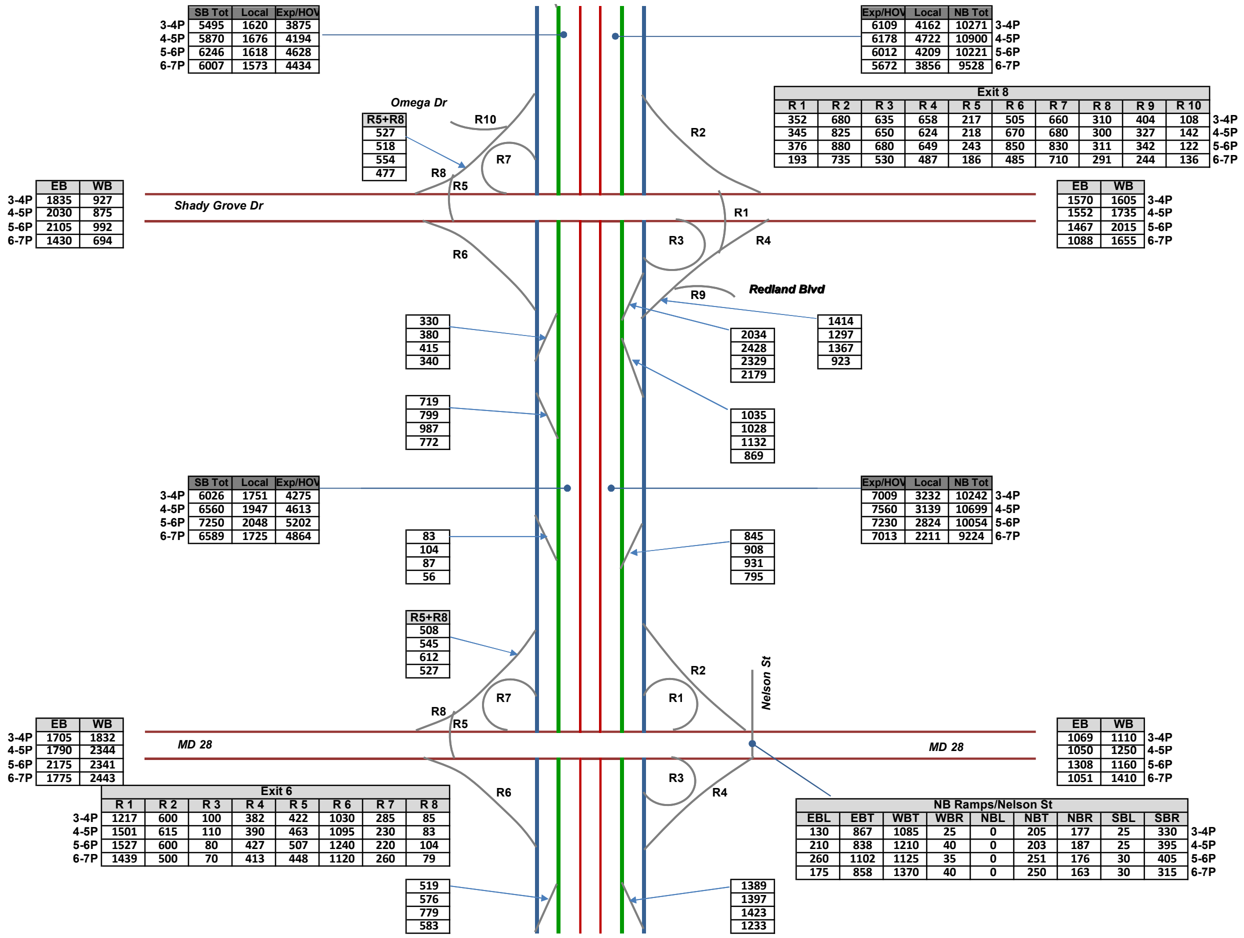
	Exit 1			
	R 1	R 4	R 6	R 7
3-4P	215	500	100	345
4-5P	265	645	160	395
5-6P	340	840	200	405
6-7P	295	600	165	390

	SB		NB
3-4P	445		715
4-5P	555		910
5-6P	605		1180
6-7P	555		895

EB	WB	
3259	3340	3-4P
4092	3645	4-5P
4417	3905	5-6P
3301	3305	6-7P

Exit 9								
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	
912	1500	565	1373	1406	730	965	412	3-4P
1002	1480	690	1635	1812	730	920	541	4-5P
871	1490	930	1585	1792	790	960	710	5-6P
1052	1359	685	1363	1378	705	912	538	6-7P

I-270 & I-495 West Side PM
Peak Period Existing Volumes



	SB Tot	Local	Exp/HOV
3-4P	5495	1620	3875
4-5P	5870	1676	4194
5-6P	6246	1618	4628
6-7P	6007	1573	4434

Exp/HOV	Local	NB Tot	
6109	4162	10271	3-4P
6178	4722	10900	4-5P
6012	4209	10221	5-6P
5672	3856	9528	6-7P

Exit 8										
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	
352	680	635	658	217	505	660	310	404	108	3-4P
345	825	650	624	218	670	680	300	327	142	4-5P
376	880	680	649	243	850	830	311	342	122	5-6P
193	735	530	487	186	485	710	291	244	136	6-7P

R5+R8
527
518
554
477

	EB	WB
3-4P	1835	927
4-5P	2030	875
5-6P	2105	992
6-7P	1430	694

EB	WB	
1570	1605	3-4P
1552	1735	4-5P
1467	2015	5-6P
1088	1655	6-7P

330
380
415
340

1414
1297
1367
923

2034
2428
2329
2179

719
799
987
772

1035
1028
1132
869

	SB Tot	Local	Exp/HOV
3-4P	6026	1751	4275
4-5P	6560	1947	4613
5-6P	7250	2048	5202
6-7P	6589	1725	4864

Exp/HOV	Local	NB Tot	
7009	3232	10242	3-4P
7560	3139	10699	4-5P
7230	2824	10054	5-6P
7013	2211	9224	6-7P

83
104
87
56

845
908
931
795

R5+R8
508
545
612
527

	EB	WB
3-4P	1705	1832
4-5P	1790	2344
5-6P	2175	2341
6-7P	1775	2443

EB	WB	
1069	1110	3-4P
1050	1250	4-5P
1308	1160	5-6P
1051	1410	6-7P

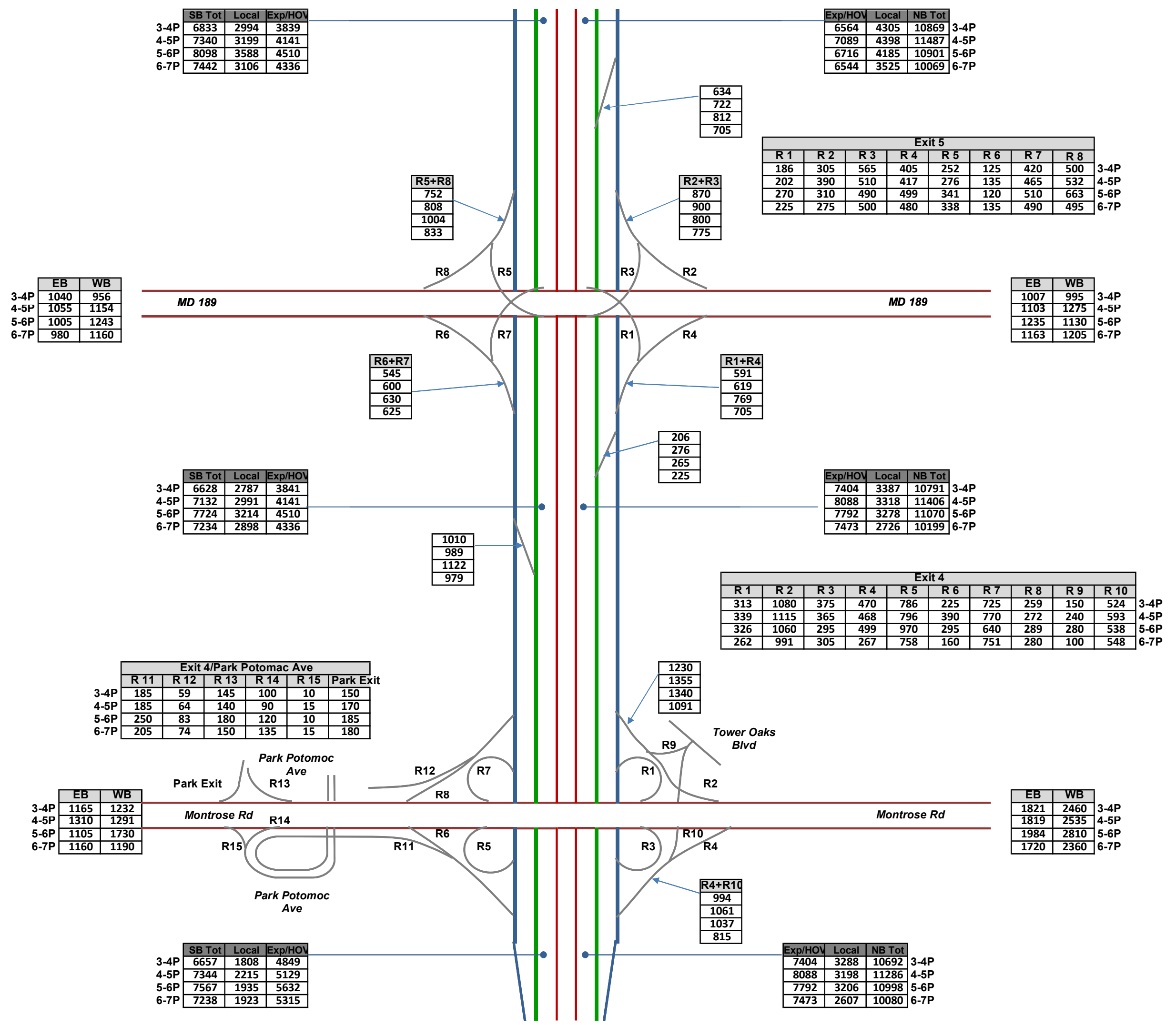
	Exit 6							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	1217	600	100	382	422	1030	285	85
4-5P	1501	615	110	390	463	1095	230	83
5-6P	1527	600	80	427	507	1240	220	104
6-7P	1439	500	70	413	448	1120	260	79

NB Ramps/Nelson St									
EBL	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBR	
130	867	1085	25	0	205	177	25	330	3-4P
210	838	1210	40	0	203	187	25	395	4-5P
260	1102	1125	35	0	251	176	30	405	5-6P
175	858	1370	40	0	250	163	30	315	6-7P

519
576
779
583

1389
1397
1423
1233

I-270 & I-495 West Side PM
Peak Period Existing Volumes



	SB Tot	Local	Exp/HOV
3-4P	6833	2994	3839
4-5P	7340	3199	4141
5-6P	8098	3588	4510
6-7P	7442	3106	4336

Exp/HOV	Local	NB Tot	
6564	4305	10869	3-4P
7089	4398	11487	4-5P
6716	4185	10901	5-6P
6544	3525	10069	6-7P

634
722
812
705

Exit 5								
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	
186	305	565	405	252	125	420	500	3-4P
202	390	510	417	276	135	465	532	4-5P
270	310	490	499	341	120	510	663	5-6P
225	275	500	480	338	135	490	495	6-7P

R5+R8
752
808
1004
833

R2+R3
870
900
800
775

	EB	WB
3-4P	1040	956
4-5P	1055	1154
5-6P	1005	1243
6-7P	980	1160

EB	WB	
1007	995	3-4P
1103	1275	4-5P
1235	1130	5-6P
1163	1205	6-7P

R6+R7
545
600
630
625

R1+R4
591
619
769
705

206
276
265
225

	SB Tot	Local	Exp/HOV
3-4P	6628	2787	3841
4-5P	7132	2991	4141
5-6P	7724	3214	4510
6-7P	7234	2898	4336

Exp/HOV	Local	NB Tot	
7404	3387	10791	3-4P
8088	3318	11406	4-5P
7792	3278	11070	5-6P
7473	2726	10199	6-7P

1010
989
1122
979

Exit 4										
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	
313	1080	375	470	786	225	725	259	150	524	3-4P
339	1115	365	468	796	390	770	272	240	593	4-5P
326	1060	295	499	970	295	640	289	280	538	5-6P
262	991	305	267	758	160	751	280	100	548	6-7P

	Exit 4/Park Potomac Ave					
	R 11	R 12	R 13	R 14	R 15	Park Exit
3-4P	185	59	145	100	10	150
4-5P	185	64	140	90	15	170
5-6P	250	83	180	120	10	185
6-7P	205	74	150	135	15	180

1230
1355
1340
1091

	EB	WB
3-4P	1165	1232
4-5P	1310	1291
5-6P	1105	1730
6-7P	1160	1190

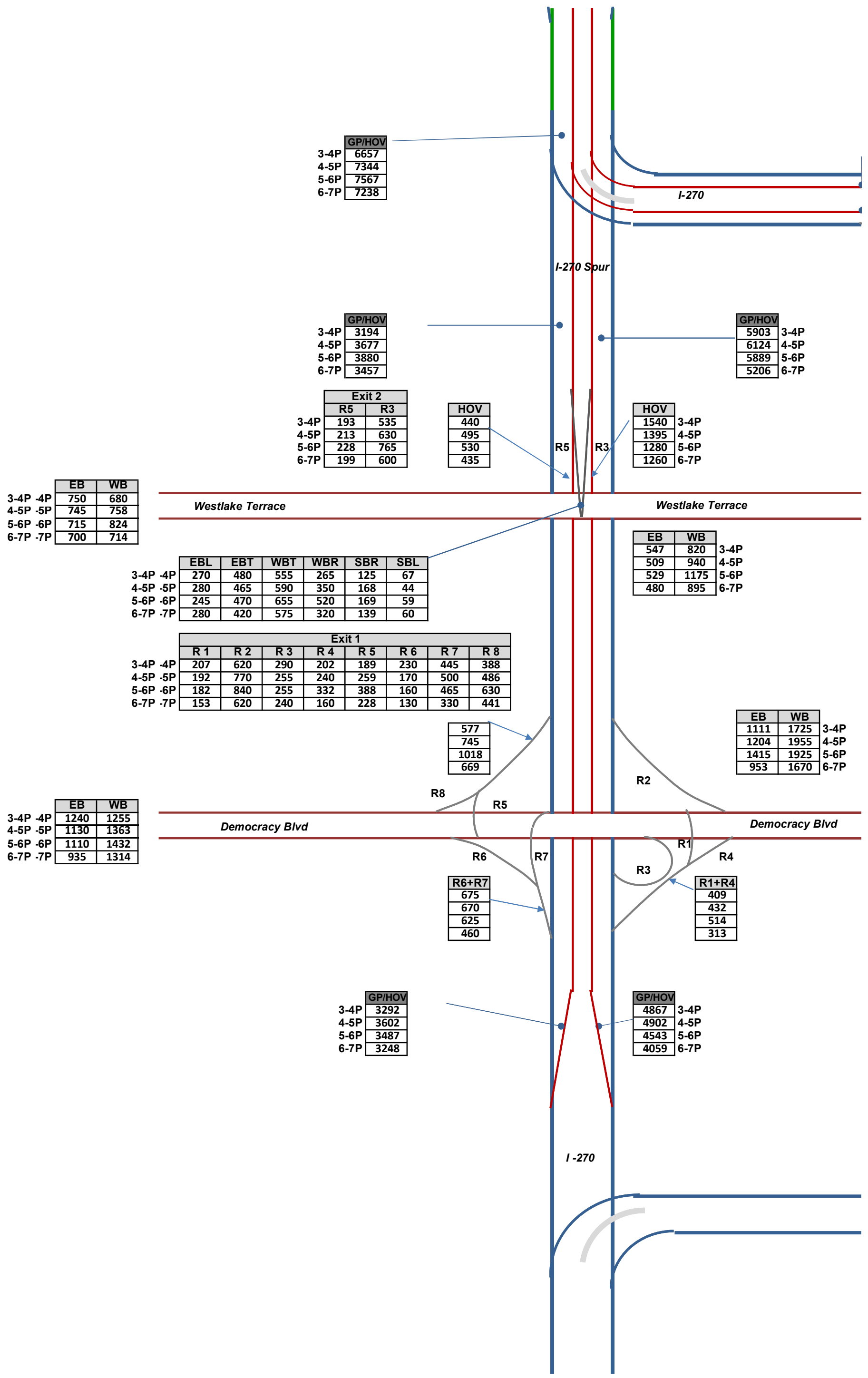
EB	WB	
1821	2460	3-4P
1819	2535	4-5P
1984	2810	5-6P
1720	2360	6-7P

R4+R10
994
1061
1037
815

	SB Tot	Local	Exp/HOV
3-4P	6657	1808	4849
4-5P	7344	2215	5129
5-6P	7567	1935	5632
6-7P	7238	1923	5315

Exp/HOV	Local	NB Tot	
7404	3288	10692	3-4P
8088	3198	11286	4-5P
7792	3206	10998	5-6P
7473	2607	10080	6-7P

I-270 & I-495 West Side PM
Peak Period Existing Volumes



	GP/HOV
3-4P	6657
4-5P	7344
5-6P	7567
6-7P	7238

	GP/HOV
3-4P	3194
4-5P	3677
5-6P	3880
6-7P	3457

GP/HOV	
5903	3-4P
6124	4-5P
5889	5-6P
5206	6-7P

	Exit 2	
	R5	R3
3-4P	193	535
4-5P	213	630
5-6P	228	765
6-7P	199	600

HOV
440
495
530
435

HOV	
1540	3-4P
1395	4-5P
1280	5-6P
1260	6-7P

	EB	WB
3-4P -4P	750	680
4-5P -5P	745	758
5-6P -6P	715	824
6-7P -7P	700	714

EB	WB	
547	820	3-4P
509	940	4-5P
529	1175	5-6P
480	895	6-7P

	EBL	EBT	WBT	WBR	SBR	SBL
3-4P -4P	270	480	555	265	125	67
4-5P -5P	280	465	590	350	168	44
5-6P -6P	245	470	655	520	169	59
6-7P -7P	280	420	575	320	139	60

	Exit 1							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P -4P	207	620	290	202	189	230	445	388
4-5P -5P	192	770	255	240	259	170	500	486
5-6P -6P	182	840	255	332	388	160	465	630
6-7P -7P	153	620	240	160	228	130	330	441

577
745
1018
669

EB	WB	
1111	1725	3-4P
1204	1955	4-5P
1415	1925	5-6P
953	1670	6-7P

	EB	WB
3-4P -4P	1240	1255
4-5P -5P	1130	1363
5-6P -6P	1110	1432
6-7P -7P	935	1314

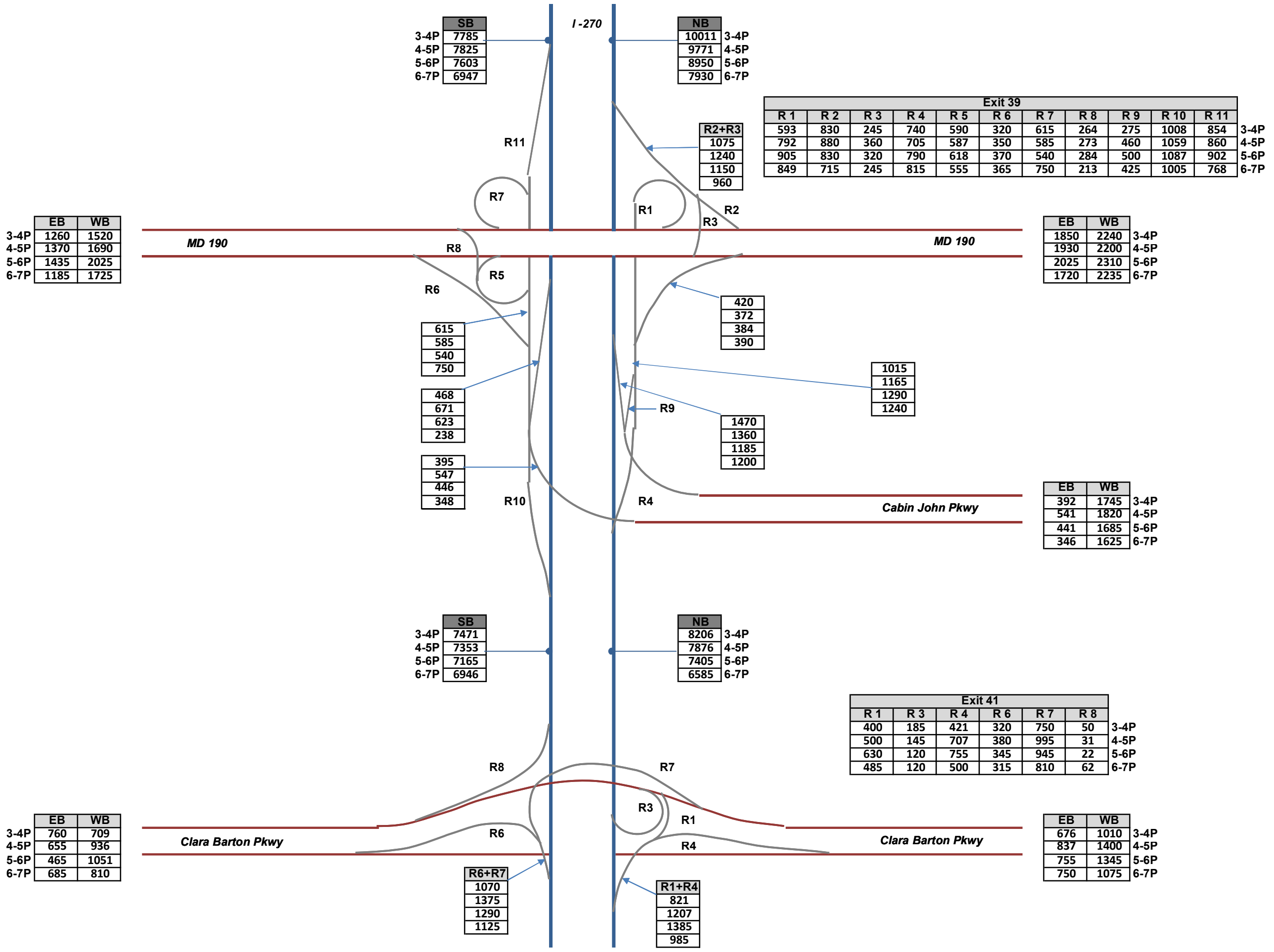
R6+R7
675
670
625
460

R1+R4
409
432
514
313

	GP/HOV
3-4P	3292
4-5P	3602
5-6P	3487
6-7P	3248

GP/HOV	
4867	3-4P
4902	4-5P
4543	5-6P
4059	6-7P

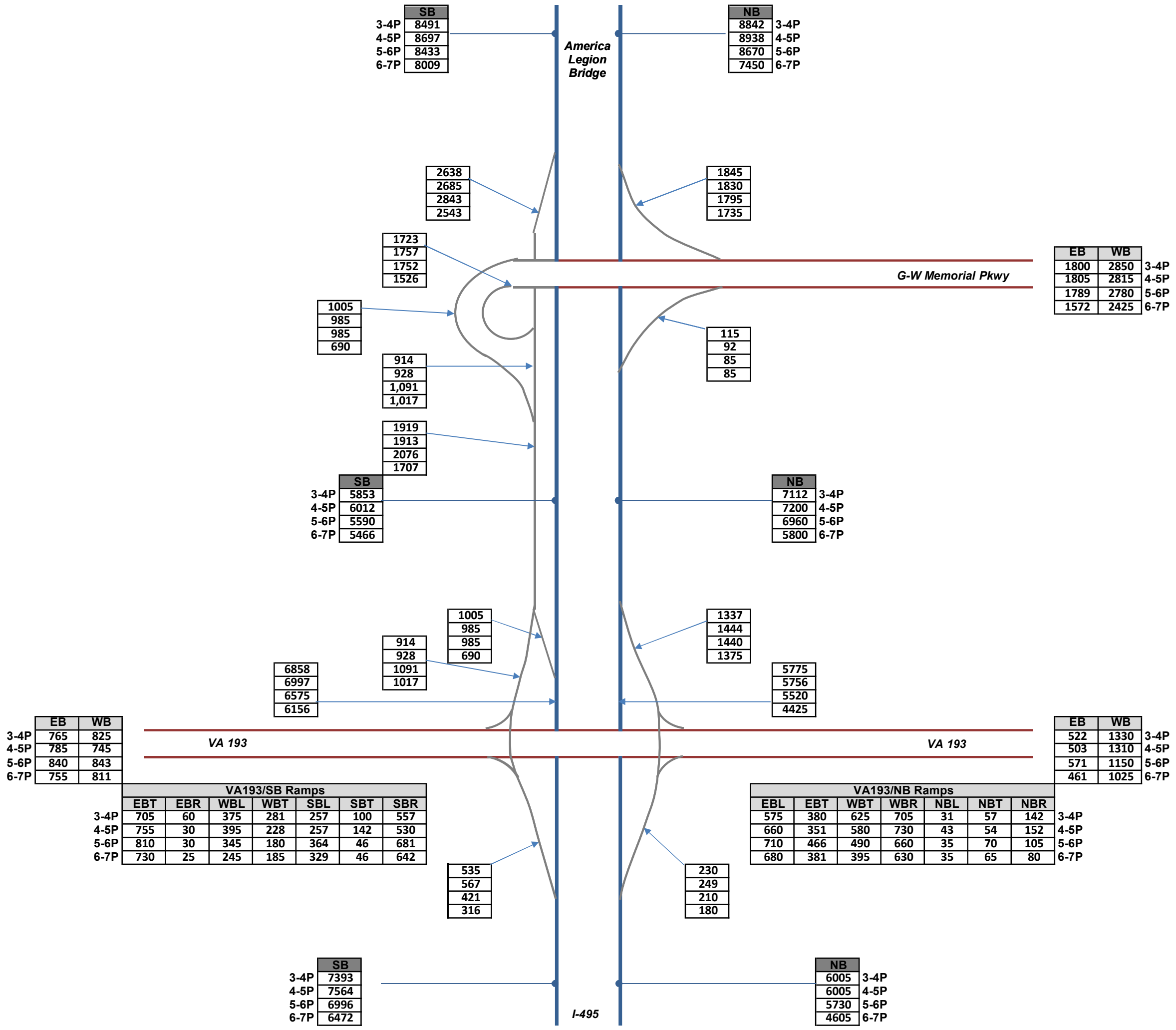
I-270 & I-495 West Side PM Peak Period Existing Volumes



Exit 39											
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	
593	830	245	740	590	320	615	264	275	1008	854	3-4P
792	880	360	705	587	350	585	273	460	1059	860	4-5P
905	830	320	790	618	370	540	284	500	1087	902	5-6P
849	715	245	815	555	365	750	213	425	1005	768	6-7P

Exit 41						
R 1	R 3	R 4	R 6	R 7	R 8	
400	185	421	320	750	50	3-4P
500	145	707	380	995	31	4-5P
630	120	755	345	945	22	5-6P
485	120	500	315	810	62	6-7P

I-270 & I-495 West Side PM
Peak Period Existing Volumes



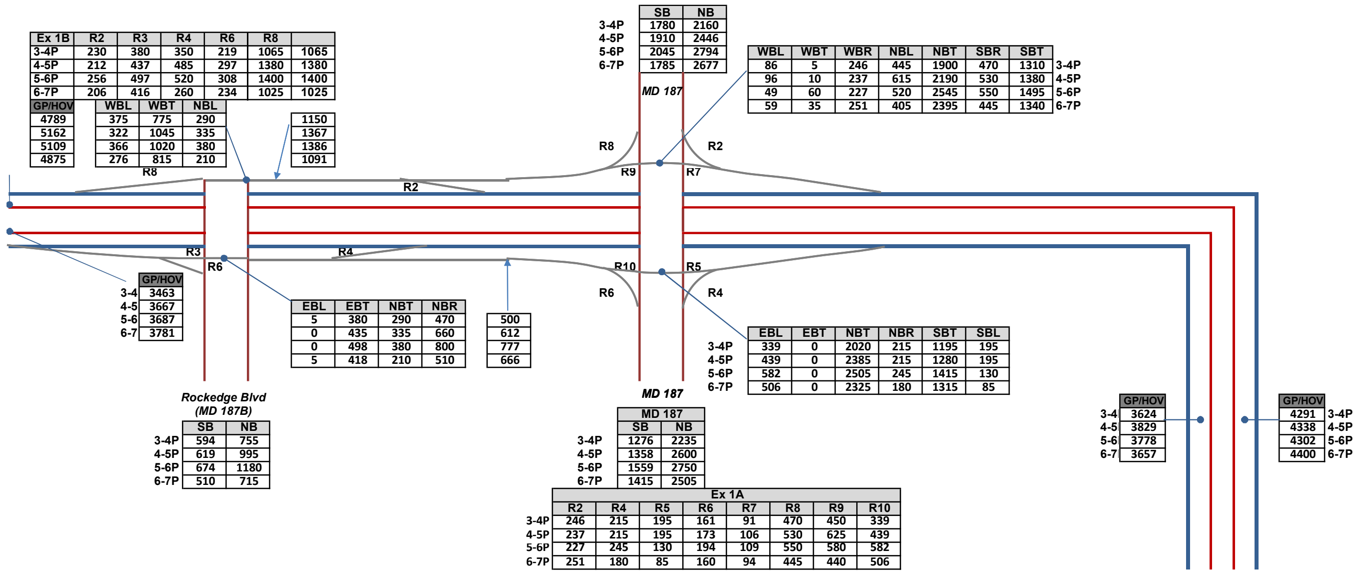
VA193/SB Ramps

	EBT	EBR	WBL	WBT	SBL	SBT	SBR
3-4P	705	60	375	281	257	100	557
4-5P	755	30	395	228	257	142	530
5-6P	810	30	345	180	364	46	681
6-7P	730	25	245	185	329	46	642

VA193/NB Ramps

EBL	EBT	WBT	WBR	NBL	NBT	NBR	
575	380	625	705	31	57	142	3-4P
660	351	580	730	43	54	152	4-5P
710	466	490	660	35	70	105	5-6P
680	381	395	630	35	65	80	6-7P

I-270 & I-495 West Side PM
Peak Period Existing Volumes



Ex 1B	R2	R3	R4	R6	R8	
3-4P	230	380	350	219	1065	1065
4-5P	212	437	485	297	1380	1380
5-6P	256	497	520	308	1400	1400
6-7P	206	416	260	234	1025	1025

GP/HOV
4789
5162
5109
4875

WBL	WBT	NBL
375	775	290
322	1045	335
366	1020	380
276	815	210

1150
1367
1386
1091

	SB	NB
3-4P	1780	2160
4-5P	1910	2446
5-6P	2045	2794
6-7P	1785	2677

WBL	WBT	WBR	NBL	NBT	SBR	SBT	
86	5	246	445	1900	470	1310	3-4P
96	10	237	615	2190	530	1380	4-5P
49	60	227	520	2545	550	1495	5-6P
59	35	251	405	2395	445	1340	6-7P

	GP/HOV
3-4	3463
4-5	3667
5-6	3687
6-7	3781

EBL	EBT	NBT	NBR
5	380	290	470
0	435	335	660
0	498	380	800
5	418	210	510

500
612
777
666

	EBL	EBT	NBT	NBR	SBT	SBL
3-4P	339	0	2020	215	1195	195
4-5P	439	0	2385	215	1280	195
5-6P	582	0	2505	245	1415	130
6-7P	506	0	2325	180	1315	85

Rockedge Blvd (MD 187B)

	SB	NB
3-4P	594	755
4-5P	619	995
5-6P	674	1180
6-7P	510	715

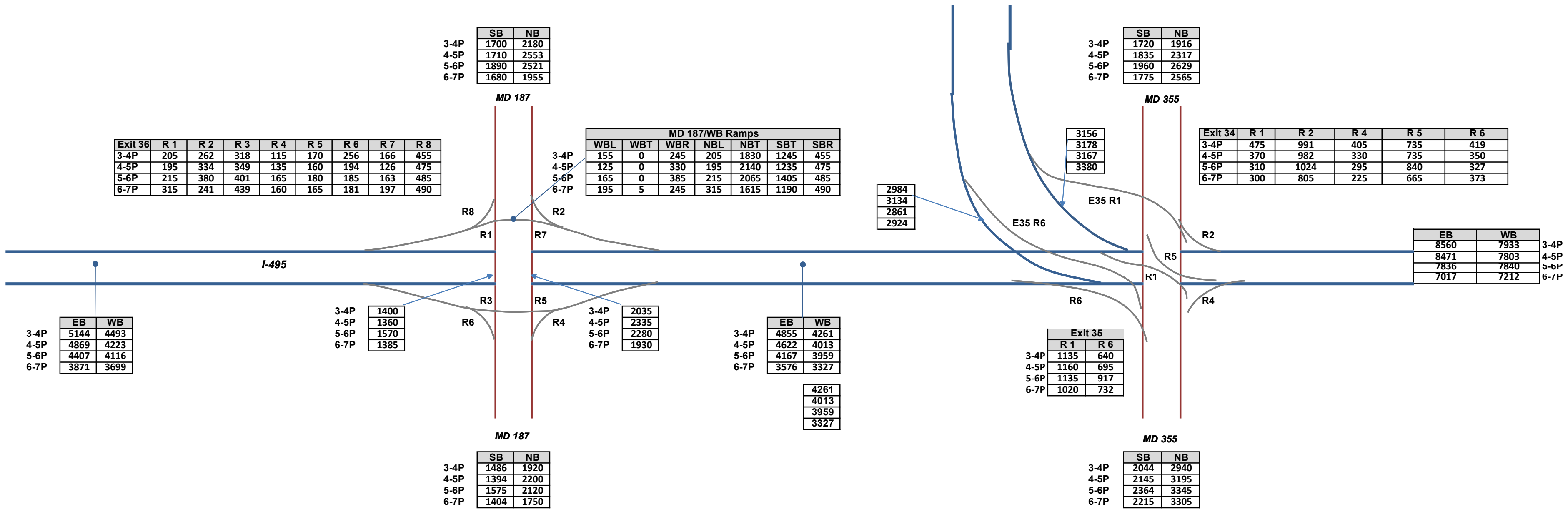
	MD 187	
	SB	NB
3-4P	1276	2235
4-5P	1358	2600
5-6P	1559	2750
6-7P	1415	2505

	Ex 1A							
	R2	R4	R5	R6	R7	R8	R9	R10
3-4P	246	215	195	161	91	470	450	339
4-5P	237	215	195	173	106	530	625	439
5-6P	227	245	130	194	109	550	580	582
6-7P	251	180	85	160	94	445	440	506

	GP/HOV
3-4	3624
4-5	3829
5-6	3778
6-7	3657

GP/HOV	
4291	3-4P
4338	4-5P
4302	5-6P
4400	6-7P

I-270 & I-495 West Side PM
Peak Period Existing Volumes



MD 187 (north)

	SB	NB
3-4P	1700	2180
4-5P	1710	2553
5-6P	1890	2521
6-7P	1680	1955

Exit 36	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	205	262	318	115	170	256	166	455
4-5P	195	334	349	135	160	194	126	475
5-6P	215	380	401	165	180	185	163	485
6-7P	315	241	439	160	165	181	197	490

	MD 187/WB Ramps						
	WBL	WBT	WBR	NBL	NBT	SBT	SBR
3-4P	155	0	245	205	1830	1245	455
4-5P	125	0	330	195	2140	1235	475
5-6P	165	0	385	215	2065	1405	485
6-7P	195	5	245	315	1615	1190	490

2984
3134
2861
2924

3156
3178
3167
3380

MD 355 (north)

	SB	NB
3-4P	1720	1916
4-5P	1835	2317
5-6P	1960	2629
6-7P	1775	2565

Exit 34	R 1	R 2	R 4	R 5	R 6
3-4P	475	991	405	735	419
4-5P	370	982	330	735	350
5-6P	310	1024	295	840	327
6-7P	300	805	225	665	373

EB	WB	
8560	7933	3-4P
8471	7803	4-5P
7836	7840	5-6P
7017	7212	6-7P

	EB	WB
3-4P	5144	4493
4-5P	4869	4223
5-6P	4407	4116
6-7P	3871	3699

3-4P	1400
4-5P	1360
5-6P	1570
6-7P	1385

3-4P	2035
4-5P	2335
5-6P	2280
6-7P	1930

	EB	WB
3-4P	4855	4261
4-5P	4622	4013
5-6P	4167	3959
6-7P	3576	3327

4261
4013
3959
3327

	Exit 35	
	R 1	R 6
3-4P	1135	640
4-5P	1160	695
5-6P	1135	917
6-7P	1020	732

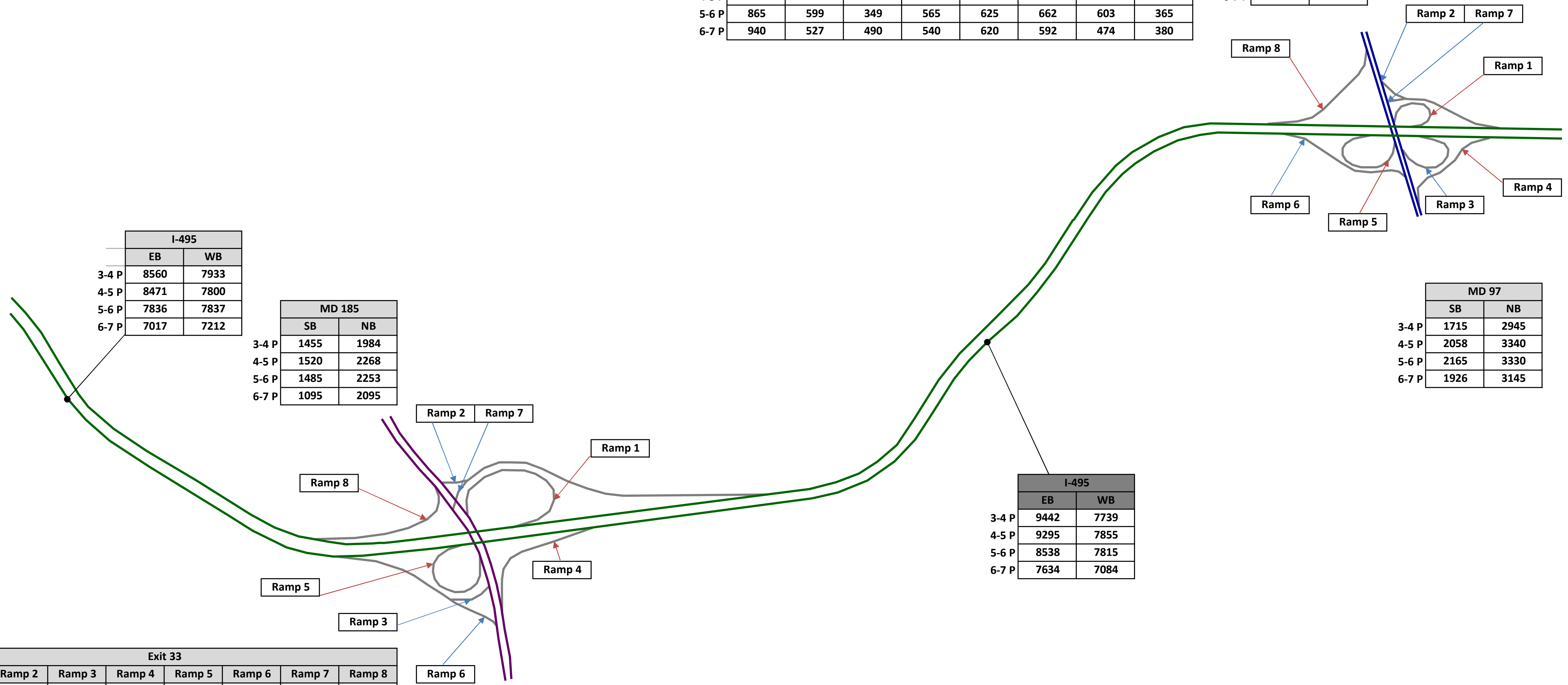
MD 187 (south)

	SB	NB
3-4P	1486	1920
4-5P	1394	2200
5-6P	1575	2120
6-7P	1404	1750

MD 355 (south)

	SB	NB
3-4P	2044	2940
4-5P	2145	3195
5-6P	2364	3345
6-7P	2215	3305

I-495 North Side PM
Peak Period Existing Volumes



	MD 97	
	SB	NB
3-4 P	1690	2294
4-5 P	1900	2796
5-6 P	1890	2848
6-7 P	1860	2682

	Exit 31							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
3-4 P	925	529	330	585	610	615	430	410
4-5 P	900	612	344	600	615	601	602	430
5-6 P	865	599	349	565	625	662	603	365
6-7 P	940	527	490	540	620	592	474	380

	I-495	
	EB	WB
3-4 P	8560	7933
4-5 P	8471	7800
5-6 P	7836	7837
6-7 P	7017	7212

	MD 185	
	SB	NB
3-4 P	1455	1984
4-5 P	1520	2268
5-6 P	1485	2253
6-7 P	1095	2095

	MD 97	
	SB	NB
3-4 P	1715	2945
4-5 P	2058	3340
5-6 P	2165	3330
6-7 P	1926	3145

	I-495	
	EB	WB
3-4 P	9442	7739
4-5 P	9295	7855
5-6 P	8538	7815
6-7 P	7634	7084

	Exit 33							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
3-4 P	845	342	352	1475	345	586	739	430
4-5 P	775	403	375	1495	305	601	812	385
5-6 P	795	377	476	1570	270	662	716	320
6-7 P	770	264	541	1545	205	592	738	360

	MD 185	
	SB	NB
3-4 P	2005	3610
4-5 P	2243	3760
5-6 P	2273	3765
6-7 P	1860	3605

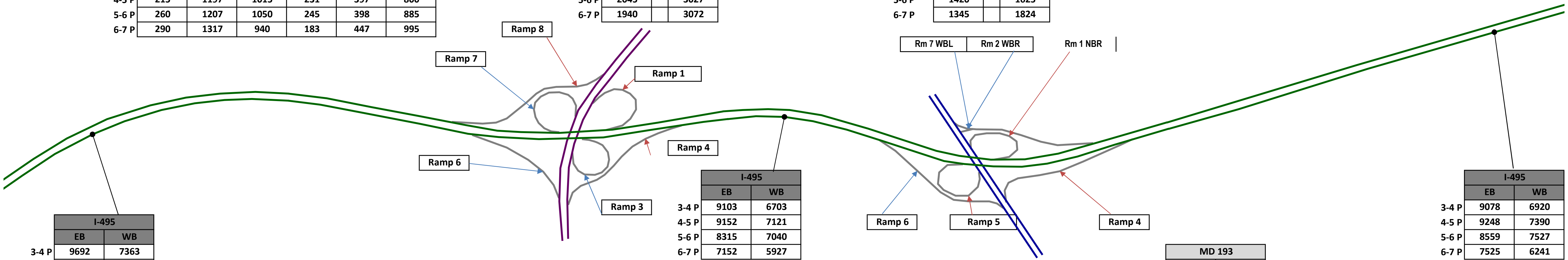
I-495 North Side PM
Peak Period Existing Volumes

	Exit 29					
	Ramp 1	Ramp 2	Ramp 4	Ramp 5	Ramp 6	Ramp 7
3-4 P	415	400	395	415	835	232
4-5 P	585	556	450	435	789	298
5-6 P	565	635	545	425	726	417
6-7 P	590	539	455	450	532	365

	Exit 30					
	Ramp 1	Ramp 3	Ramp 4	Ramp 6	Ramp 7	Ramp 8
3-4 P	185	1149	840	280	410	885
4-5 P	215	1197	1015	231	397	800
5-6 P	260	1207	1050	245	398	885
6-7 P	290	1317	940	183	447	995

	US 29		
	SB		NB
3-4 P	1865		2564
4-5 P	1930		2872
5-6 P	2045		3027
6-7 P	1940		3072

	MD 193		
	SB		NB
3-4 P	1285		1675
4-5 P	1395		1856
5-6 P	1420		1625
6-7 P	1345		1824



	I-495	
	EB	WB
3-4 P	9692	7363
4-5 P	9565	7739
5-6 P	8717	7787
6-7 P	7712	6765

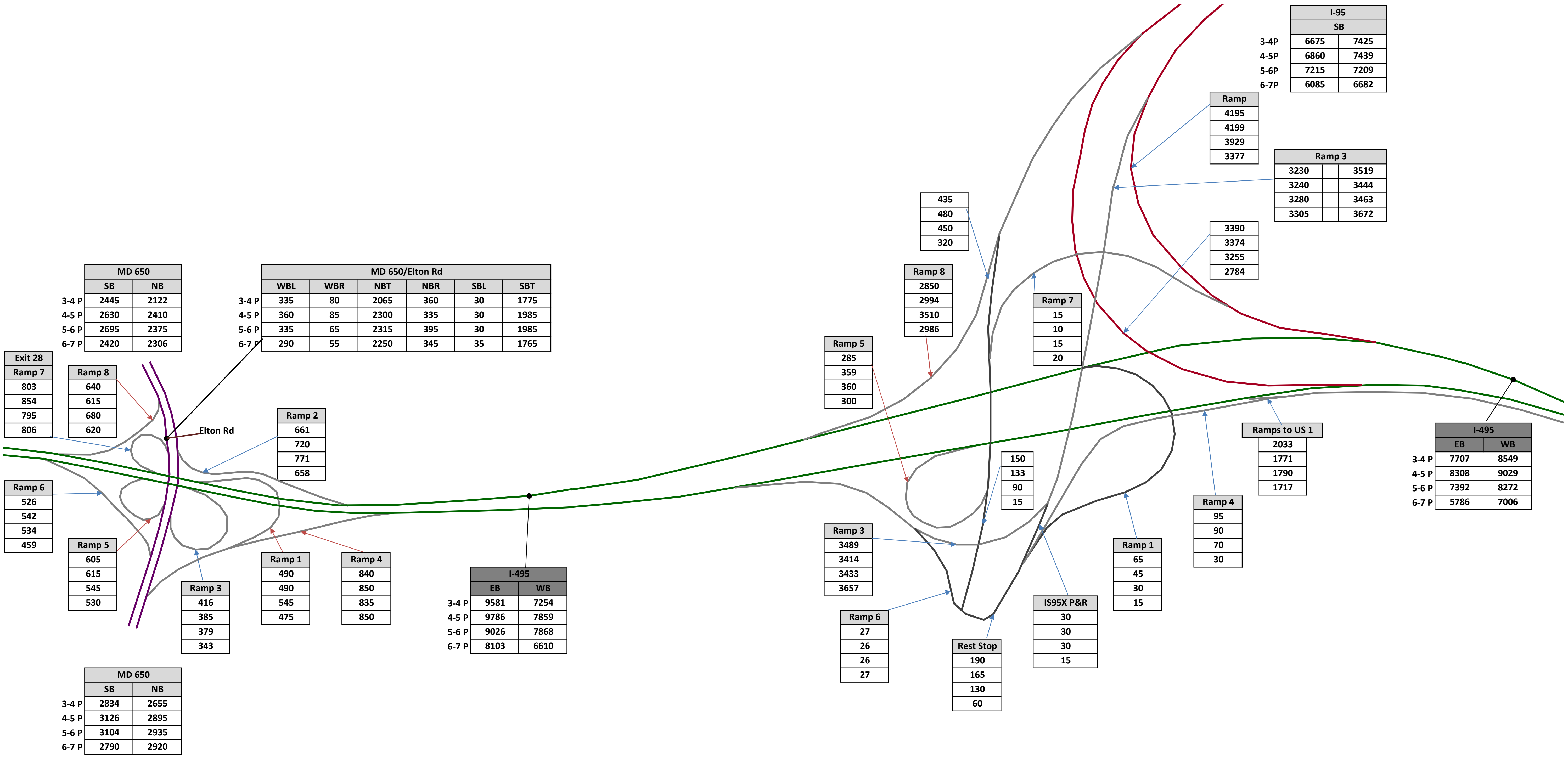
	I-495	
	EB	WB
3-4 P	9103	6703
4-5 P	9152	7121
5-6 P	8315	7040
6-7 P	7152	5927

	I-495	
	EB	WB
3-4 P	9078	6920
4-5 P	9248	7390
5-6 P	8559	7527
6-7 P	7525	6241

	US 29	
	SB	NB
3-4 P	1670	2440
4-5 P	1758	2905
5-6 P	1803	3130
6-7 P	1575	2985

	MD 193	
	SB	NB
3-4 P	1937	2085
4-5 P	2047	2335
5-6 P	2138	2100
6-7 P	1792	2330

I-495 North Side PM
Peak Period Existing Volumes



	MD 650	
	SB	NB
3-4 P	2445	2122
4-5 P	2630	2410
5-6 P	2695	2375
6-7 P	2420	2306

	MD 650/Elton Rd					
	WBL	WBR	NBT	NBR	SBL	SBT
3-4 P	335	80	2065	360	30	1775
4-5 P	360	85	2300	335	30	1985
5-6 P	335	65	2315	395	30	1985
6-7 P	290	55	2250	345	35	1765

Exit 28
Ramp 7
803
854
795
806

Ramp 8
640
615
680
620

Ramp 2
661
720
771
658

Ramp 6
526
542
534
459

Ramp 5
605
615
545
530

Ramp 3
416
385
379
343

Ramp 1
490
490
545
475

Ramp 4
840
850
835
850

	I-495	
	EB	WB
3-4 P	9581	7254
4-5 P	9786	7859
5-6 P	9026	7868
6-7 P	8103	6610

	MD 650	
	SB	NB
3-4 P	2834	2655
4-5 P	3126	2895
5-6 P	3104	2935
6-7 P	2790	2920

	I-95	
	SB	
3-4P	6675	7425
4-5P	6860	7439
5-6P	7215	7209
6-7P	6085	6682

Ramp
4195
4199
3929
3377

Ramp 3		
3230		3519
3240		3444
3280		3463
3305		3672

435
480
450
320

3390
3374
3255
2784

Ramp 8
2850
2994
3510
2986

Ramp 7
15
10
15
20

Ramp 5
285
359
360
300

Ramps to US 1
2033
1771
1790
1717

150
133
90
15

	I-495	
	EB	WB
3-4 P	7707	8549
4-5 P	8308	9029
5-6 P	7392	8272
6-7 P	5786	7006

Ramp 4
95
90
70
30

Ramp 3
3489
3414
3433
3657

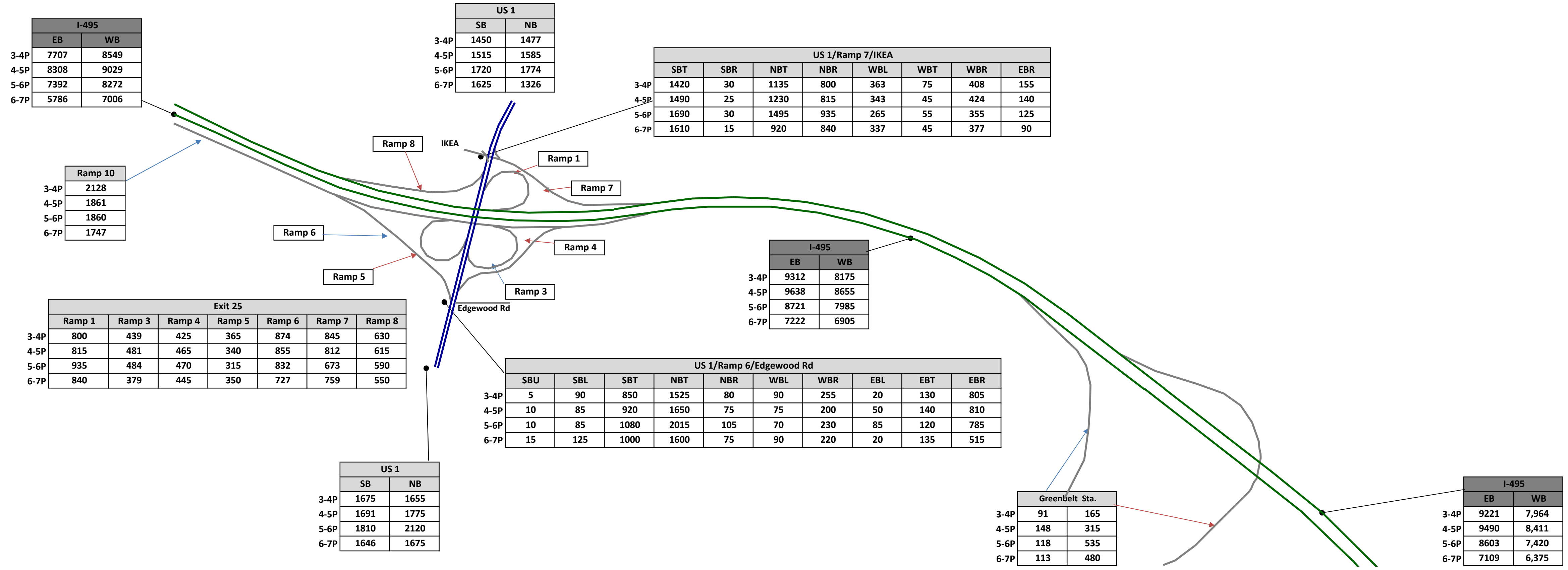
Ramp 1
65
45
30
15

IS95X P&R
30
30
30
15

Ramp 6
27
26
26
27

Rest Stop
190
165
130
60

I-495 Northeast Side PM Peak Period Existing Volumes



	I-495	
	EB	WB
3-4P	7707	8549
4-5P	8308	9029
5-6P	7392	8272
6-7P	5786	7006

	US 1	
	SB	NB
3-4P	1450	1477
4-5P	1515	1585
5-6P	1720	1774
6-7P	1625	1326

	US 1/Ramp 7/IKEA							
	SBT	SBR	NBT	NBR	WBL	WBT	WBR	EBR
3-4P	1420	30	1135	800	363	75	408	155
4-5P	1490	25	1230	815	343	45	424	140
5-6P	1690	30	1495	935	265	55	355	125
6-7P	1610	15	920	840	337	45	377	90

	Ramp 10
3-4P	2128
4-5P	1861
5-6P	1860
6-7P	1747

	I-495	
	EB	WB
3-4P	9312	8175
4-5P	9638	8655
5-6P	8721	7985
6-7P	7222	6905

	Exit 25						
	Ramp 1	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
3-4P	800	439	425	365	874	845	630
4-5P	815	481	465	340	855	812	615
5-6P	935	484	470	315	832	673	590
6-7P	840	379	445	350	727	759	550

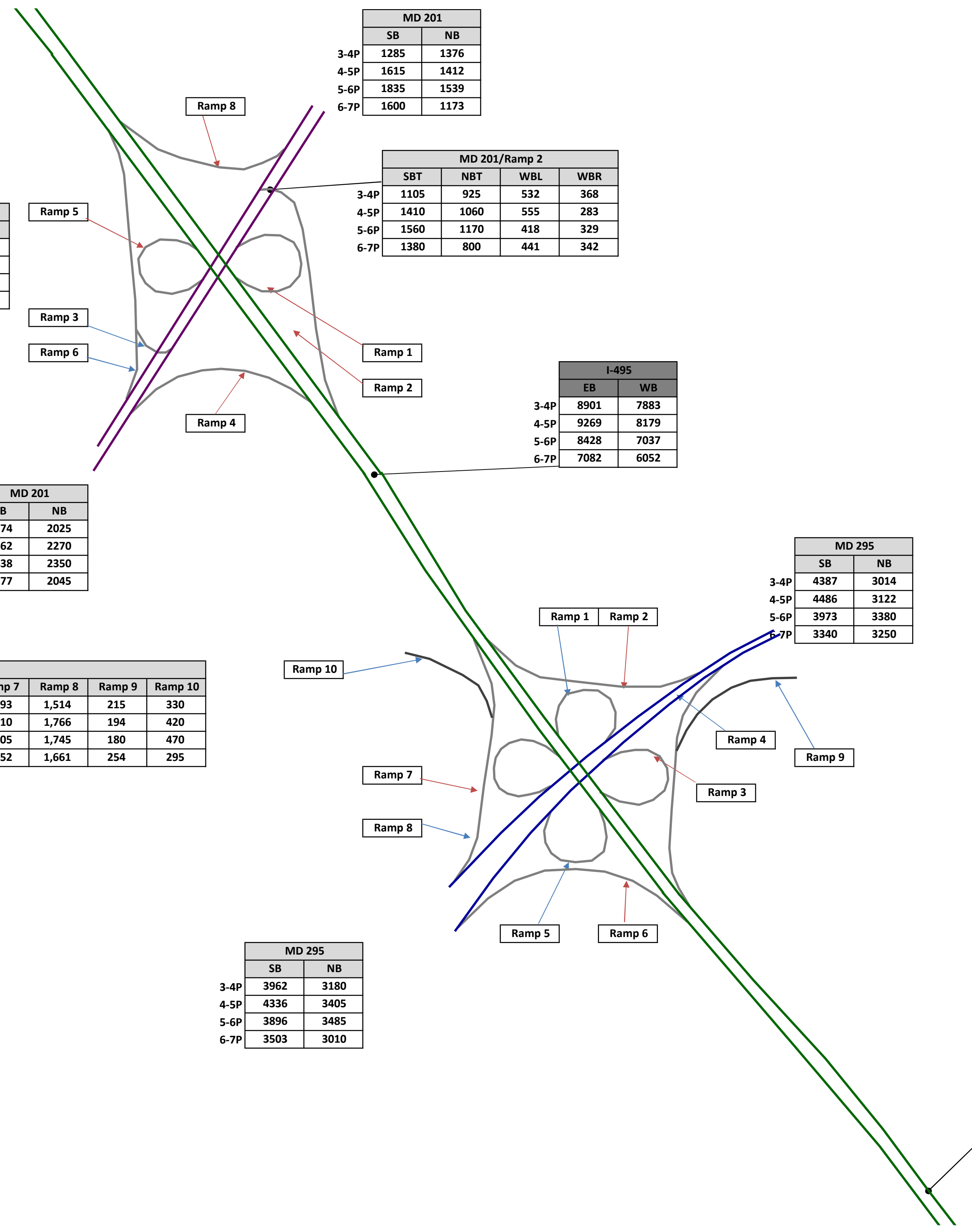
	US 1/Ramp 6/Edgewood Rd									
	SBU	SBL	SBT	NBT	NBR	WBL	WBR	EBL	EBT	EBR
3-4P	5	90	850	1525	80	90	255	20	130	805
4-5P	10	85	920	1650	75	75	200	50	140	810
5-6P	10	85	1080	2015	105	70	230	85	120	785
6-7P	15	125	1000	1600	75	90	220	20	135	515

	US 1	
	SB	NB
3-4P	1675	1655
4-5P	1691	1775
5-6P	1810	2120
6-7P	1646	1675

	Greenbelt Sta.	
3-4P	91	165
4-5P	148	315
5-6P	118	535
6-7P	113	480

	I-495	
	EB	WB
3-4P	9221	7,964
4-5P	9490	8,411
5-6P	8603	7,420
6-7P	7109	6,375

I-495 Northeast Side PM
Peak Period Existing Volumes



	MD 201	
	SB	NB
3-4P	1285	1376
4-5P	1615	1412
5-6P	1835	1539
6-7P	1600	1173

	MD 201/Ramp 2			
	SBT	NBT	WBL	WBR
3-4P	1105	925	532	368
4-5P	1410	1060	555	283
5-6P	1560	1170	418	329
6-7P	1380	800	441	342

	Exit 23						
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8
3-4P	800	899	468	685	605	1142	180
4-5P	865	838	439	715	660	1157	205
5-6P	855	747	365	650	660	1120	275
6-7P	885	782	271	600	645	1001	220

	I-495	
	EB	WB
3-4P	8901	7883
4-5P	9269	8179
5-6P	8428	7037
6-7P	7082	6052

	MD 201	
	SB	NB
3-4P	2174	2025
4-5P	2462	2270
5-6P	2438	2350
6-7P	2177	2045

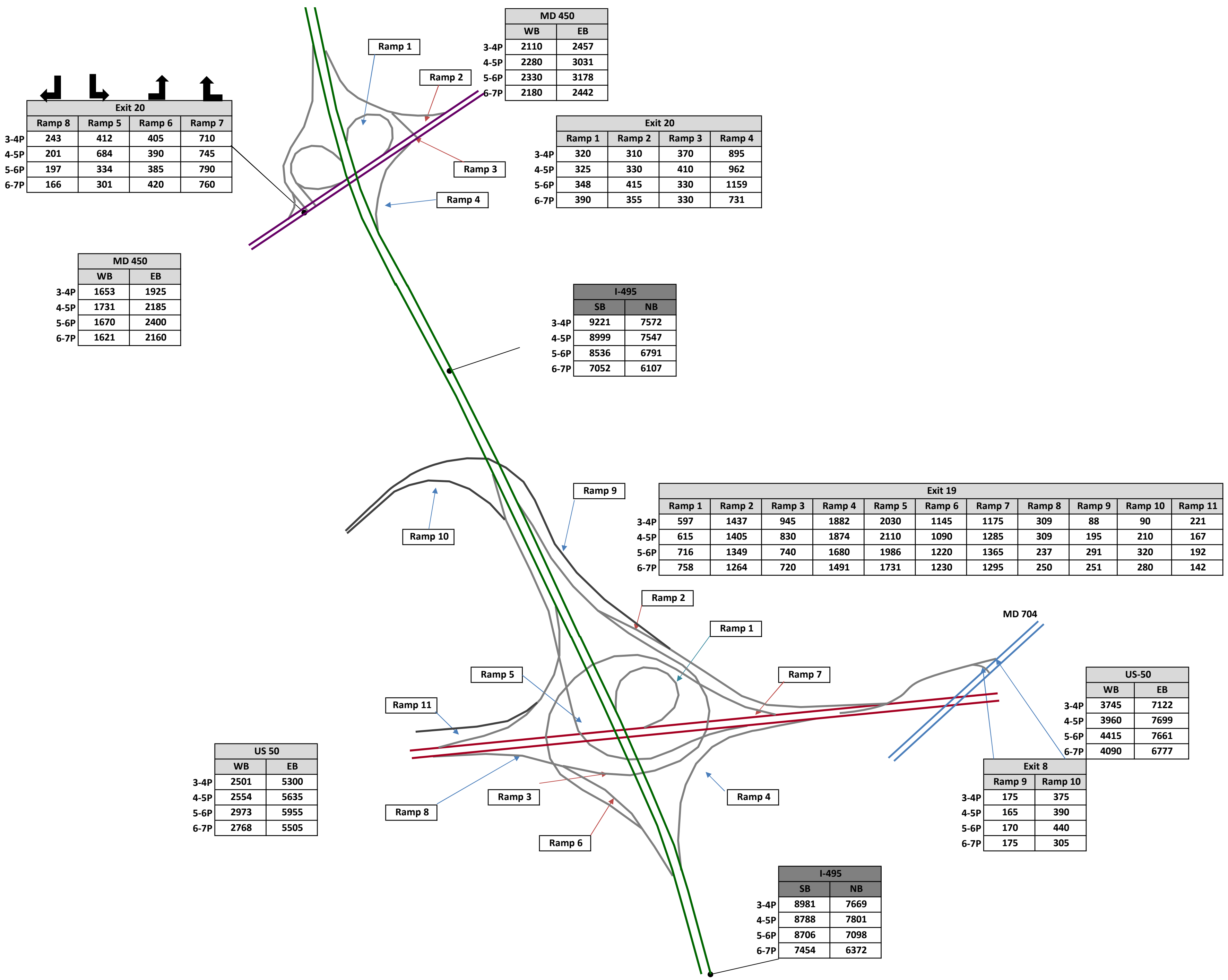
	MD 295	
	SB	NB
3-4P	4387	3014
4-5P	4486	3122
5-6P	3973	3380
6-7P	3340	3250

	Exit 22									
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
3-4P	50	596	1,445	930	389	40	1,393	1,514	215	330
4-5P	40	646	1,685	918	514	30	1,310	1,766	194	420
5-6P	34	651	1,460	889	491	25	1,205	1,745	180	470
6-7P	44	490	1,230	1,041	459	30	1,052	1,661	254	295

	MD 295	
	SB	NB
3-4P	3962	3180
4-5P	4336	3405
5-6P	3896	3485
6-7P	3503	3010

	I-495	
	SB	NB
3-4P	8761	7037
4-5P	8749	7000
5-6P	7892	6029
6-7P	6339	5671

I-495 Northeast Side PM
Peak Period Existing Volumes



	MD 450	
	WB	EB
3-4P	2110	2457
4-5P	2280	3031
5-6P	2330	3178
6-7P	2180	2442

	Exit 20			
	Ramp 8	Ramp 5	Ramp 6	Ramp 7
3-4P	243	412	405	710
4-5P	201	684	390	745
5-6P	197	334	385	790
6-7P	166	301	420	760

	Exit 20			
	Ramp 1	Ramp 2	Ramp 3	Ramp 4
3-4P	320	310	370	895
4-5P	325	330	410	962
5-6P	348	415	330	1159
6-7P	390	355	330	731

	MD 450	
	WB	EB
3-4P	1653	1925
4-5P	1731	2185
5-6P	1670	2400
6-7P	1621	2160

	I-495	
	SB	NB
3-4P	9221	7572
4-5P	8999	7547
5-6P	8536	6791
6-7P	7052	6107

	Exit 19										
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10	Ramp 11
3-4P	597	1437	945	1882	2030	1145	1175	309	88	90	221
4-5P	615	1405	830	1874	2110	1090	1285	309	195	210	167
5-6P	716	1349	740	1680	1986	1220	1365	237	291	320	192
6-7P	758	1264	720	1491	1731	1230	1295	250	251	280	142

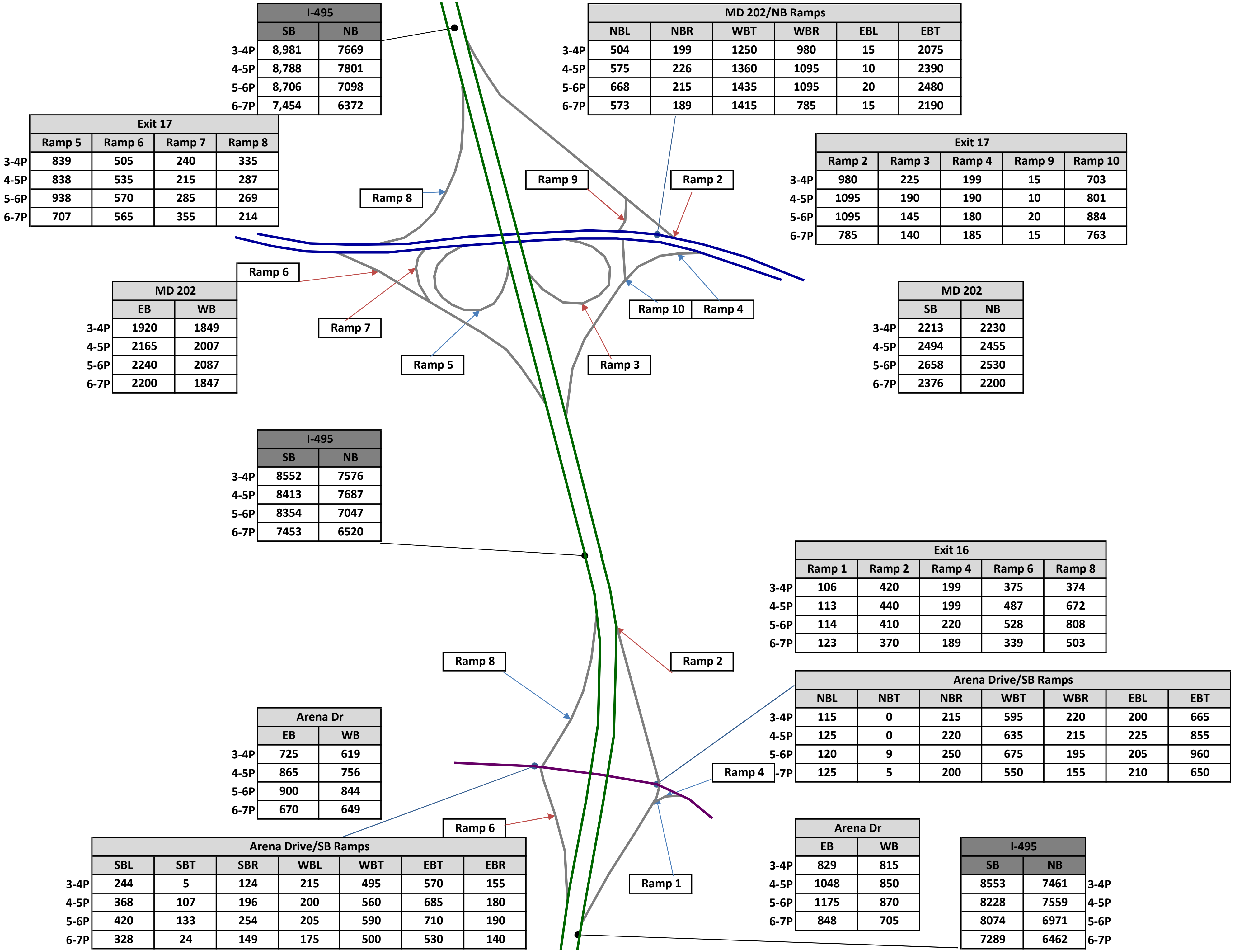
	US-50	
	WB	EB
3-4P	3745	7122
4-5P	3960	7699
5-6P	4415	7661
6-7P	4090	6777

	US 50	
	WB	EB
3-4P	2501	5300
4-5P	2554	5635
5-6P	2973	5955
6-7P	2768	5505

	Exit 8	
	Ramp 9	Ramp 10
3-4P	175	375
4-5P	165	390
5-6P	170	440
6-7P	175	305

	I-495	
	SB	NB
3-4P	8981	7669
4-5P	8788	7801
5-6P	8706	7098
6-7P	7454	6372

I-495 East Side PM
Peak Period Existing Volumes



	I-495	
	SB	NB
3-4P	8,981	7669
4-5P	8,788	7801
5-6P	8,706	7098
6-7P	7,454	6372

	MD 202/NB Ramps					
	NBL	NBR	WBT	WBR	EBL	EBT
3-4P	504	199	1250	980	15	2075
4-5P	575	226	1360	1095	10	2390
5-6P	668	215	1435	1095	20	2480
6-7P	573	189	1415	785	15	2190

	Exit 17			
	Ramp 5	Ramp 6	Ramp 7	Ramp 8
3-4P	839	505	240	335
4-5P	838	535	215	287
5-6P	938	570	285	269
6-7P	707	565	355	214

	Exit 17				
	Ramp 2	Ramp 3	Ramp 4	Ramp 9	Ramp 10
3-4P	980	225	199	15	703
4-5P	1095	190	190	10	801
5-6P	1095	145	180	20	884
6-7P	785	140	185	15	763

	MD 202	
	EB	WB
3-4P	1920	1849
4-5P	2165	2007
5-6P	2240	2087
6-7P	2200	1847

	MD 202	
	SB	NB
3-4P	2213	2230
4-5P	2494	2455
5-6P	2658	2530
6-7P	2376	2200

	I-495	
	SB	NB
3-4P	8552	7576
4-5P	8413	7687
5-6P	8354	7047
6-7P	7453	6520

	Exit 16				
	Ramp 1	Ramp 2	Ramp 4	Ramp 6	Ramp 8
3-4P	106	420	199	375	374
4-5P	113	440	199	487	672
5-6P	114	410	220	528	808
6-7P	123	370	189	339	503

	Arena Drive/SB Ramps						
	NBL	NBT	NBR	WBT	WBR	EBL	EBT
3-4P	115	0	215	595	220	200	665
4-5P	125	0	220	635	215	225	855
5-6P	120	9	250	675	195	205	960
-7P	125	5	200	550	155	210	650

	Arena Dr	
	EB	WB
3-4P	725	619
4-5P	865	756
5-6P	900	844
6-7P	670	649

	Arena Drive/SB Ramps						
	SBL	SBT	SBR	WBL	WBT	EBT	EBR
3-4P	244	5	124	215	495	570	155
4-5P	368	107	196	200	560	685	180
5-6P	420	133	254	205	590	710	190
6-7P	328	24	149	175	500	530	140

	Arena Dr	
	EB	WB
3-4P	829	815
4-5P	1048	850
5-6P	1175	870
6-7P	848	705

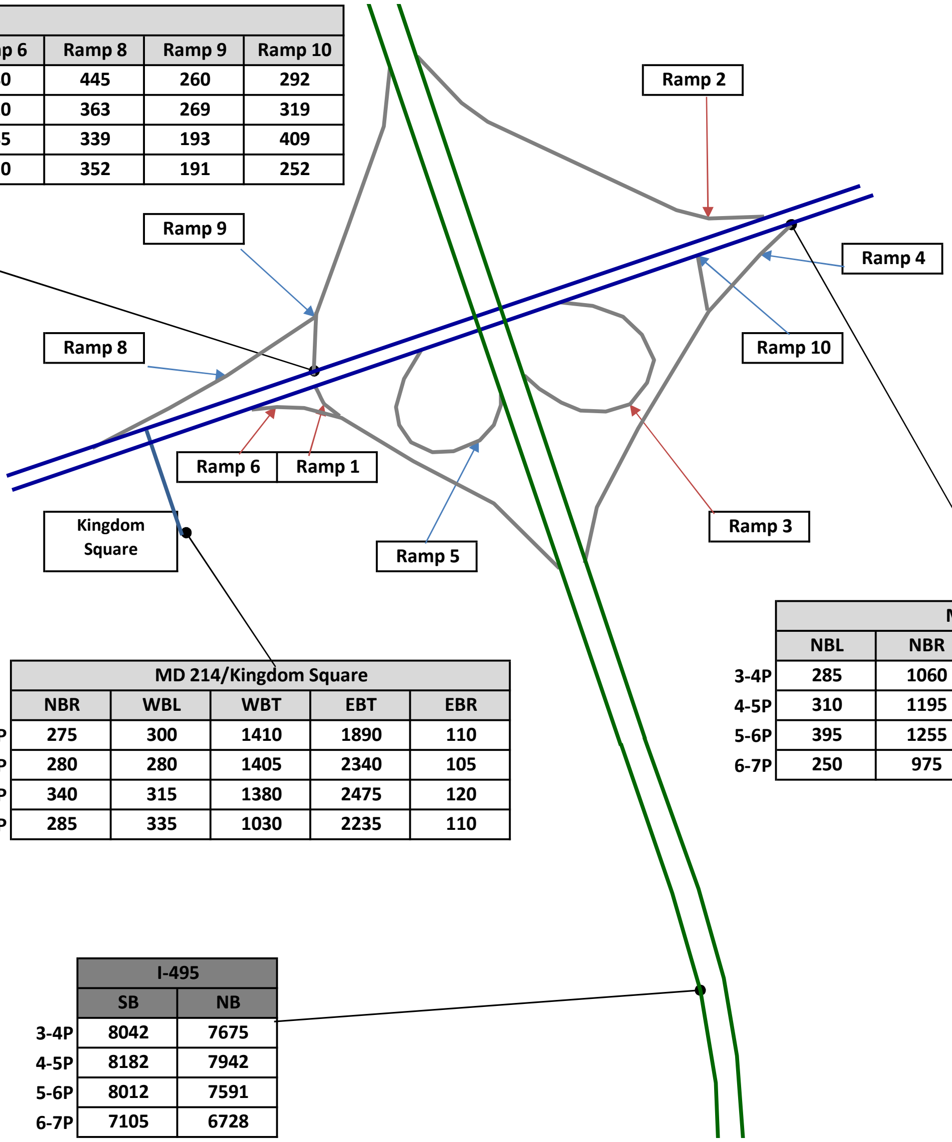
I-495		
SB	NB	
8553	7461	3-4P
8228	7559	4-5P
8074	6971	5-6P
7289	6462	6-7P

I-495 East Side PM
Peak Period Existing Volumes

	Exit 15								
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8	Ramp 9	Ramp 10
3-4P	465	415	750	1087	551	280	445	260	292
4-5P	735	420	745	1229	569	420	363	269	319
5-6P	695	345	745	1301	610	385	339	193	409
6-7P	695	300	670	984	726	390	352	191	252

	MD 214/SB Ramps				
	SBR	WBL	WBT	EBT	EBR
3-4P	245	465	1465	1885	280
4-5P	275	735	1410	2200	420
5-6P	200	695	1495	2430	385
6-7P	190	695	1175	2130	390

	MD 214	
	EB	WB
3-4P	2773	2060
4-5P	3253	2255
5-6P	3596	2140
6-7P	3170	1920



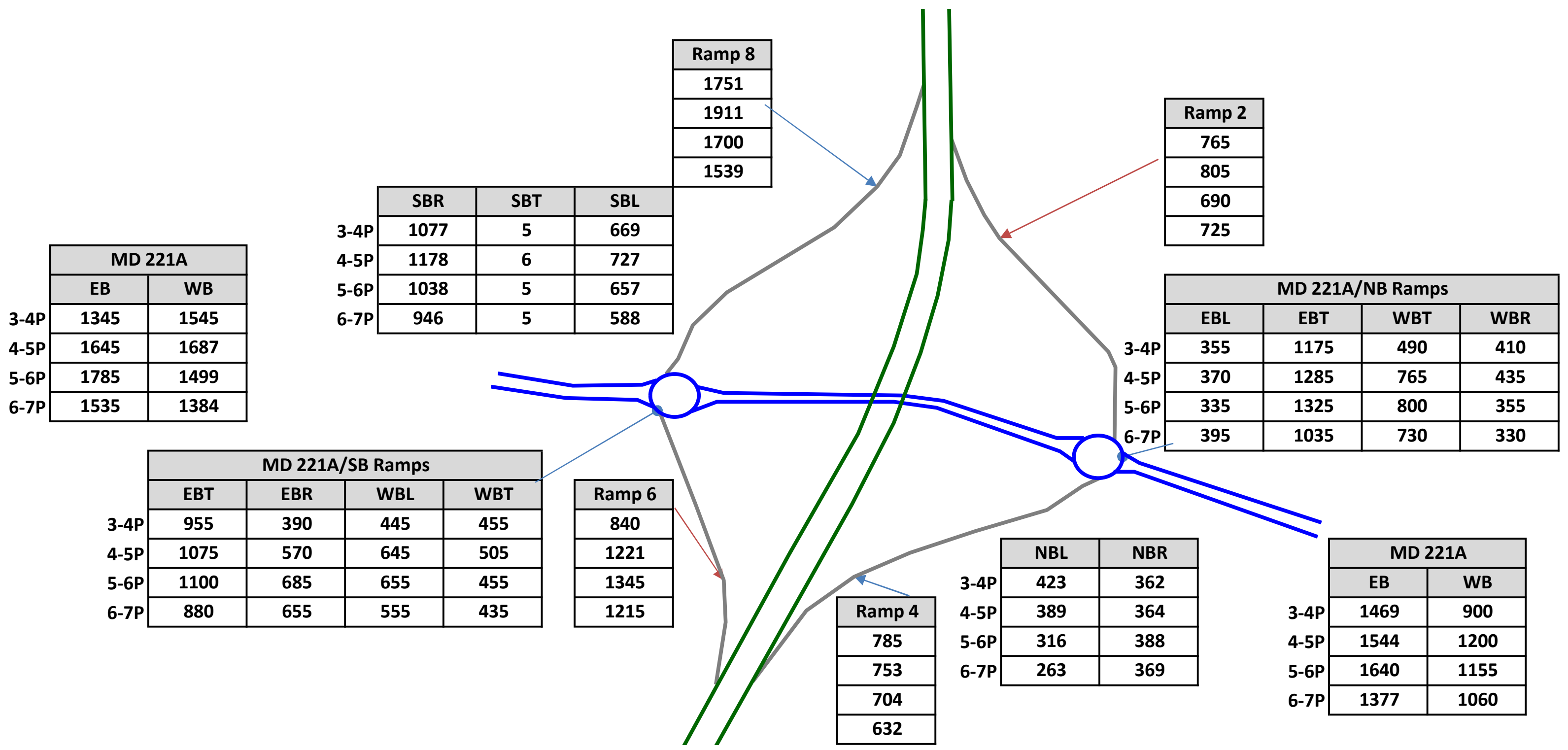
	MD 214	
	EB	WB
3-4P	2000	1855
4-5P	2445	1768
5-6P	2595	1719
6-7P	2345	1382

	MD 214/NB Ramps				
	NBL	NBR	WBT	WBR	EBT
3-4P	285	1060	1645	415	1655
4-5P	310	1195	1835	420	2035
5-6P	395	1255	1795	345	2315
6-7P	250	975	1620	300	2180

	MD 214/Kingdom Square				
	NBR	WBL	WBT	EBT	EBR
3-4P	275	300	1410	1890	110
4-5P	280	280	1405	2340	105
5-6P	340	315	1380	2475	120
6-7P	285	335	1030	2235	110

	I-495	
	SB	NB
3-4P	8042	7675
4-5P	8182	7942
5-6P	8012	7591
6-7P	7105	6728

I-495 East Side PM
Peak Period Existing Volumes



Ramp 8
1751
1911
1700
1539

	SBR	SBT	SBL
3-4P	1077	5	669
4-5P	1178	6	727
5-6P	1038	5	657
6-7P	946	5	588

Ramp 2
765
805
690
725

	MD 221A	
	EB	WB
3-4P	1345	1545
4-5P	1645	1687
5-6P	1785	1499
6-7P	1535	1384

	MD 221A/NB Ramps			
	EBL	EBT	WBT	WBR
3-4P	355	1175	490	410
4-5P	370	1285	765	435
5-6P	335	1325	800	355
6-7P	395	1035	730	330

	MD 221A/SB Ramps			
	EBT	EBR	WBL	WBT
3-4P	955	390	445	455
4-5P	1075	570	645	505
5-6P	1100	685	655	455
6-7P	880	655	555	435

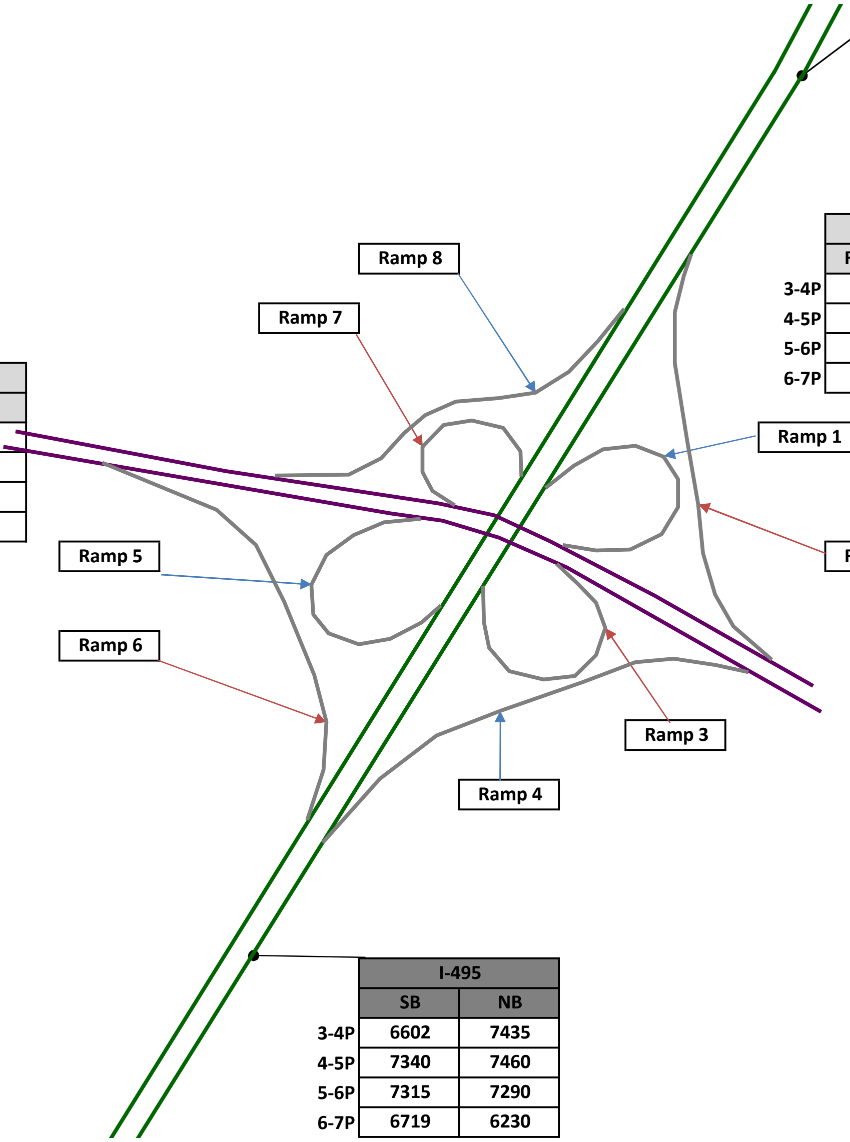
Ramp 6
840
1221
1345
1215

	NBL	NBR
3-4P	423	362
4-5P	389	364
5-6P	316	388
6-7P	263	369

Ramp 4
785
753
704
632

	MD 221A	
	EB	WB
3-4P	1469	900
4-5P	1544	1200
5-6P	1640	1155
6-7P	1377	1060

I-495 East Side PM
Peak Period Existing Volumes



	I-495	
	SB	NB
3-4P	7131	7695
4-5P	7492	7890
5-6P	7657	7605
6-7P	6781	6635

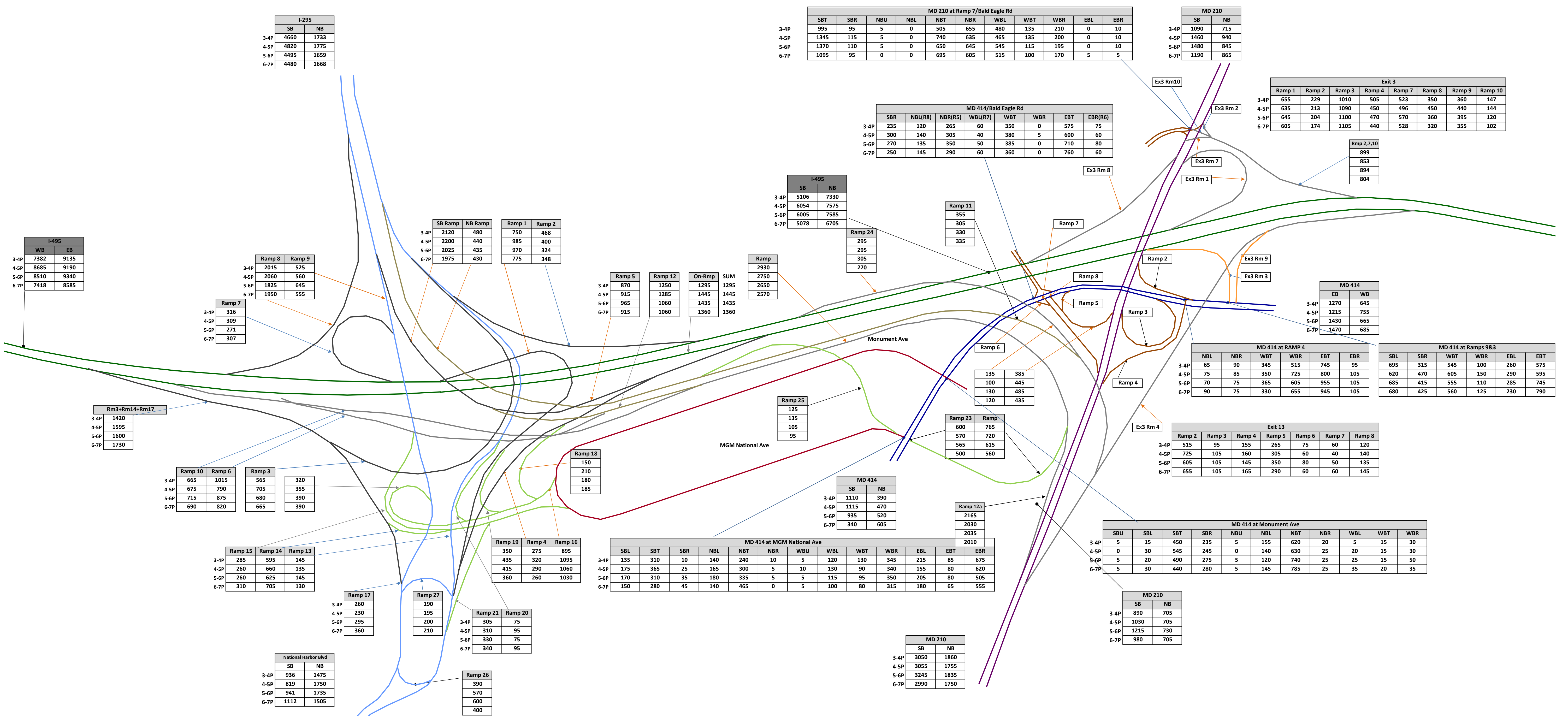
	Exit 11							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
3-4P	670	1055	755	880	884	505	625	775
4-5P	735	1055	815	705	823	735	715	779
5-6P	715	910	805	685	747	600	600	795
6-7P	665	805	880	615	642	770	575	765

	MD 4	
	SB	NB
3-4P	2155	1775
4-5P	2470	1874
5-6P	2515	1820
6-7P	2355	1615

	MD 4	
	SB	NB
3-4P	2659	2010
4-5P	2448	2130
5-6P	2542	1820
6-7P	1962	1565

	I-495	
	SB	NB
3-4P	6602	7435
4-5P	7340	7460
5-6P	7315	7290
6-7P	6719	6230

I-495 South Side PM
Peak Period Existing Volumes



	I-295	
	SB	NB
3-4P	4660	1733
4-5P	4820	1775
5-6P	4495	1659
6-7P	4480	1668

	I-495	
	WB	EB
3-4P	7382	9135
4-5P	8685	9190
5-6P	8510	9340
6-7P	7418	8585

	Ramp 8	Ramp 9
3-4P	2015	525
4-5P	2060	560
5-6P	1825	645
6-7P	1950	555

	Ramp 7
3-4P	316
4-5P	309
5-6P	271
6-7P	307

	SB Ramp	NB Ramp
3-4P	2120	480
4-5P	2200	440
5-6P	2025	435
6-7P	1975	430

Ramp 1	Ramp 2
750	468
985	400
970	324
775	348

	Ramp 5
3-4P	870
4-5P	915
5-6P	965
6-7P	915

Ramp 12
1250
1285
1060
1060

On-Rmp	SUM
1295	1295
1445	1445
1435	1435
1360	1360

Ramp
2930
2750
2650
2570

	I-495	
	SB	NB
3-4P	5106	7330
4-5P	6054	7575
5-6P	6005	7585
6-7P	5078	6705

Ramp 24
295
295
305
270

	MD 210 at Ramp 7/Bald Eagle Rd										
	SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBR
3-4P	995	95	5	0	505	655	480	135	210	0	10
4-5P	1345	115	5	0	740	635	465	135	200	0	10
5-6P	1370	110	5	0	650	645	545	115	195	0	10
6-7P	1095	95	0	0	695	605	515	100	170	5	5

	MD 210	
	SB	NB
3-4P	1090	715
4-5P	1460	940
5-6P	1480	845
6-7P	1190	865

	Exit 3							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 7	Ramp 8	Ramp 9	Ramp 10
3-4P	655	229	1010	505	523	350	360	147
4-5P	635	213	1090	450	496	450	440	144
5-6P	645	204	1100	470	570	360	395	120
6-7P	605	174	1105	440	528	320	355	102

	MD 414/Bald Eagle Rd							
	SBR	NBL(R8)	NBR(R5)	WBL(R7)	WBT	WBR	EBT	EBR(R6)
3-4P	235	120	265	60	350	0	575	75
4-5P	300	140	305	40	380	5	600	60
5-6P	270	135	350	50	385	0	710	80
6-7P	250	145	290	60	360	0	760	60

Rmp 2,7,10
899
853
894
804

Ramp 11
355
305
330
335

135	385
100	445
130	485
120	435

	MD 414	
	EB	WB
3-4P	1270	645
4-5P	1215	755
5-6P	1430	665
6-7P	1470	685

	MD 414 at RAMP 4					
	NBL	NBR	WBT	WBR	EBT	EBR
3-4P	65	90	345	515	745	95
4-5P	75	85	350	725	800	105
5-6P	70	75	365	605	955	105
6-7P	90	75	330	655	945	105

MD 414 at Ramps 9&3					
SBL	SBR	WBT	WBR	EBL	EBT
695	315	545	100	260	575
620	470	605	150	290	595
685	415	555	110	285	745
680	425	560	125	230	790

	Exit 13						
	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
3-4P	515	95	155	265	75	60	120
4-5P	725	105	160	305	60	40	140
5-6P	605	105	145	350	80	50	135
6-7P	655	105	165	290	60	60	145

Ramp 23	Ramp
600	765
570	720
565	615
500	560

Ramp 25
125
135
105
95

Ramp 18
150
210
180
185

	MD 414	
	SB	NB
3-4P	1110	390
4-5P	1115	470
5-6P	935	520
6-7P	340	605

Ramp 12a
2165
2030
2035
2010

	MD 414 at Monument Ave										
	SBU	SBL	SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR
3-4P	5	15	450	235	5	155	620	20	5	15	30
4-5P	0	30	545	245	0	140	630	25	20	15	30
5-6P	5	20	490	275	5	120	740	25	25	15	50
6-7P	5	30	440	280	5	145	785	25	35	20	35

	MD 210	
	SB	NB
3-4P	890	705
4-5P	1030	705
5-6P	1215	730
6-7P	980	705

	Rm3+Rm14+Rm17
3-4P	1420
4-5P	1595
5-6P	1600
6-7P	1730

	Ramp 10	Ramp 6
3-4P	665	1015
4-5P	675	790
5-6P	715	875
6-7P	690	820

Ramp 3
565
705
680
665

320
355
390
390

	Ramp 15	Ramp 14	Ramp 13
3-4P	285	595	145
4-5P	260	660	135
5-6P	260	625	145
6-7P	310	705	130

	Ramp 17
3-4P	260
4-5P	230
5-6P	295
6-7P	360

Ramp 27
190
195
200
210

Ramp 19	Ramp 4	Ramp 16
350	275	895
435	320	1095
415	290	1060
360	260	1030

	Ramp 21	Ramp 20
3-4P	305	75
4-5P	310	95
5-6P	330	75
6-7P	340	95

	MD 414 at MGM National Ave												
	SBL	SBT	SBR	NBL	NBT	NBR	WBU	WBL	WBT	WBR	EBL	EBT	EBR
3-4P	135	310	10	140	240	10	5	120	130	345	215	85	675
4-5P	175	365	25	165	300	5	10	130	90	340	155	80	620
5-6P	170	310	35	180	335	5	5	115	95	350	205	80	505
6-7P	150	280	45	140	465	0	5	100	80	315	180	65	555

	National Harbor Blvd	
	SB	NB
3-4P	936	1475
4-5P	819	1750
5-6P	941	1735
6-7P	1112	1505

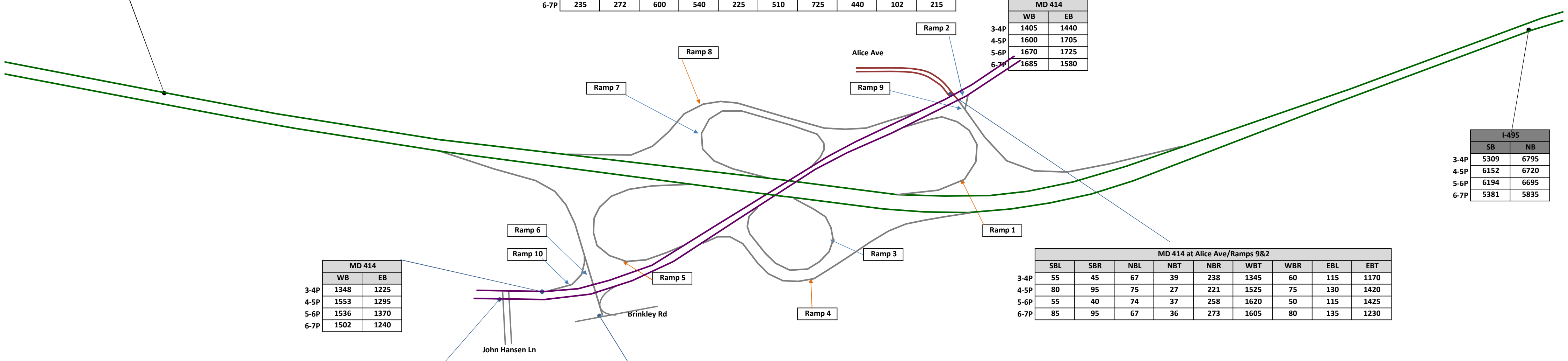
Ramp 26
390
570
600
400

	MD 210	
	SB	NB
3-4P	3050	1860
4-5P	3055	1755
5-6P	3245	1835
6-7P	2990	1750

I-495 South Side PM
Peak Period Existing Volumes

	I-495	
	SB	NB
3-4P	5000	7185
4-5P	5822	7375
5-6P	5894	7350
6-7P	4957	6395

	Exit 4									
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
3-4P	345	238	495	525	195	430	731	420	105	185
4-5P	285	220	640	505	185	505	748	455	102	200
5-6P	315	258	650	525	210	470	747	500	110	270
6-7P	235	272	600	540	225	510	725	440	102	215



	MD 414	
	WB	EB
3-4P	1405	1440
4-5P	1600	1705
5-6P	1670	1725
6-7P	1685	1580

	I-495	
	SB	NB
3-4P	5309	6795
4-5P	6152	6720
5-6P	6194	6695
6-7P	5381	5835

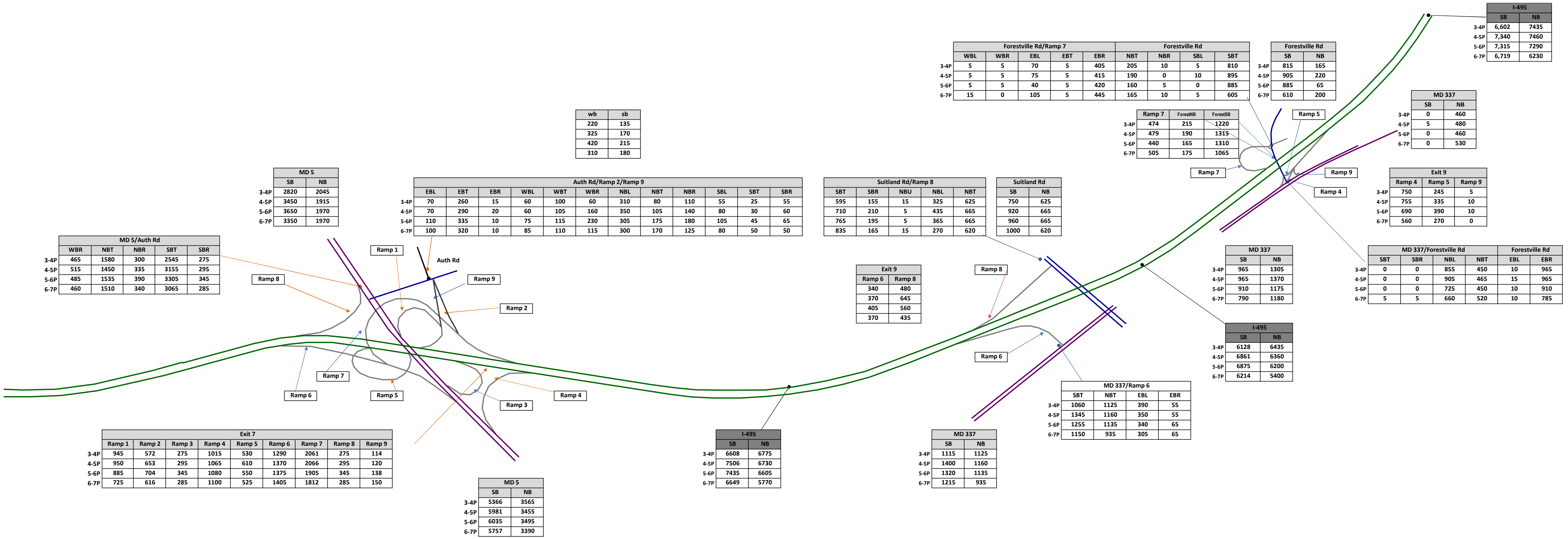
	MD 414	
	WB	EB
3-4P	1348	1225
4-5P	1553	1295
5-6P	1536	1370
6-7P	1502	1240

	MD 414 at Alice Ave/Ramps 9&2								
	SBL	SBR	NBL	NBT	NBR	WBT	WBR	EBL	EBT
3-4P	55	45	67	39	238	1345	60	115	1170
4-5P	80	95	75	27	221	1525	75	130	1420
5-6P	55	40	74	37	258	1620	50	115	1425
6-7P	85	95	67	36	273	1605	80	135	1230

	MD 414 at John Hansen Ln					
	NBL	NBR	WBL	WBT	EBT	EBR
3-4P	265	220	400	1083	930	295
4-5P	260	255	460	1293	905	390
5-6P	240	265	455	1296	960	410
6-7P	260	280	495	1242	870	370

MD 414 at RPMp 6/Spur from Brinkley Rd							
SBL	SBT	SBR	NBR	WBL	WBT	EBT	EBR
35	395	185	495	275	1298	1130	20
50	455	200	515	250	1553	1135	25
35	435	270	485	290	1481	1210	15
35	475	215	385	305	1522	1120	30

I-495 South Side PM
Peak Period Existing Volumes



	I-495	
	SB	NB
3-4P	6,602	7435
4-5P	7,340	7460
5-6P	7,315	7290
6-7P	6,719	6230

	Forestville Rd/Ramp 7					Forestville Rd			
	WBL	WBR	EBL	EBT	EBR	NBT	NBR	SBL	SBT
3-4P	5	5	70	5	405	205	10	5	810
4-5P	5	5	75	5	415	190	0	10	895
5-6P	5	5	40	5	420	160	5	0	885
6-7P	15	0	105	5	445	165	10	5	605

	Forestville Rd	
	SB	NB
3-4P	815	165
4-5P	905	220
5-6P	885	65
6-7P	610	200

	MD 337	
	SB	NB
3-4P	0	460
4-5P	5	480
5-6P	0	460
6-7P	0	530

wb	sb
220	135
325	170
420	215
310	180

	Ramp 7	ForestNB	ForestSB
3-4P	474	215	1220
4-5P	479	190	1315
5-6P	440	165	1310
6-7P	505	175	1065

	MD 5	
	SB	NB
3-4P	2820	2045
4-5P	3450	1915
5-6P	3650	1970
6-7P	3350	1970

	Auth Rd/Ramp 2/Ramp 9											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3-4P	70	260	15	60	100	60	310	80	110	55	25	55
4-5P	70	290	20	60	105	160	350	105	140	80	30	60
5-6P	110	335	10	75	115	230	305	175	180	105	45	65
6-7P	100	320	10	85	110	115	300	170	125	80	50	50

Suitland Rd/Ramp 8				
SBT	SBR	NBU	NBL	NBT
595	155	15	325	625
710	210	5	435	665
765	195	5	365	665
835	165	15	270	620

Suitland Rd	
SB	NB
750	625
920	665
960	665
1000	620

	Exit 9		
	Ramp 4	Ramp 5	Ramp 9
3-4P	750	245	5
4-5P	755	335	10
5-6P	690	390	10
6-7P	560	270	0

	MD 5/Auth Rd				
	WBR	NBT	NBR	SBT	SBR
3-4P	465	1580	300	2545	275
4-5P	515	1450	335	3155	295
5-6P	485	1535	390	3305	345
6-7P	460	1510	340	3065	285

	MD 337	
	SB	NB
3-4P	965	1305
4-5P	965	1370
5-6P	910	1175
6-7P	790	1180

	MD 337/Forestville Rd				Forestville Rd	
	SBT	SBR	NBL	NBT	EBL	EBR
3-4P	0	0	855	450	10	965
4-5P	0	0	905	465	15	965
5-6P	0	0	725	450	10	910
6-7P	5	5	660	520	10	785

Exit 9	
Ramp 6	Ramp 8
340	480
370	645
405	560
370	435

	I-495	
	SB	NB
3-4P	6128	6435
4-5P	6861	6360
5-6P	6875	6200
6-7P	6214	5400

	MD 337/Ramp 6			
	SBT	NBT	EBL	EBR
3-4P	1060	1125	390	55
4-5P	1345	1160	350	55
5-6P	1255	1135	340	65
6-7P	1150	935	305	65

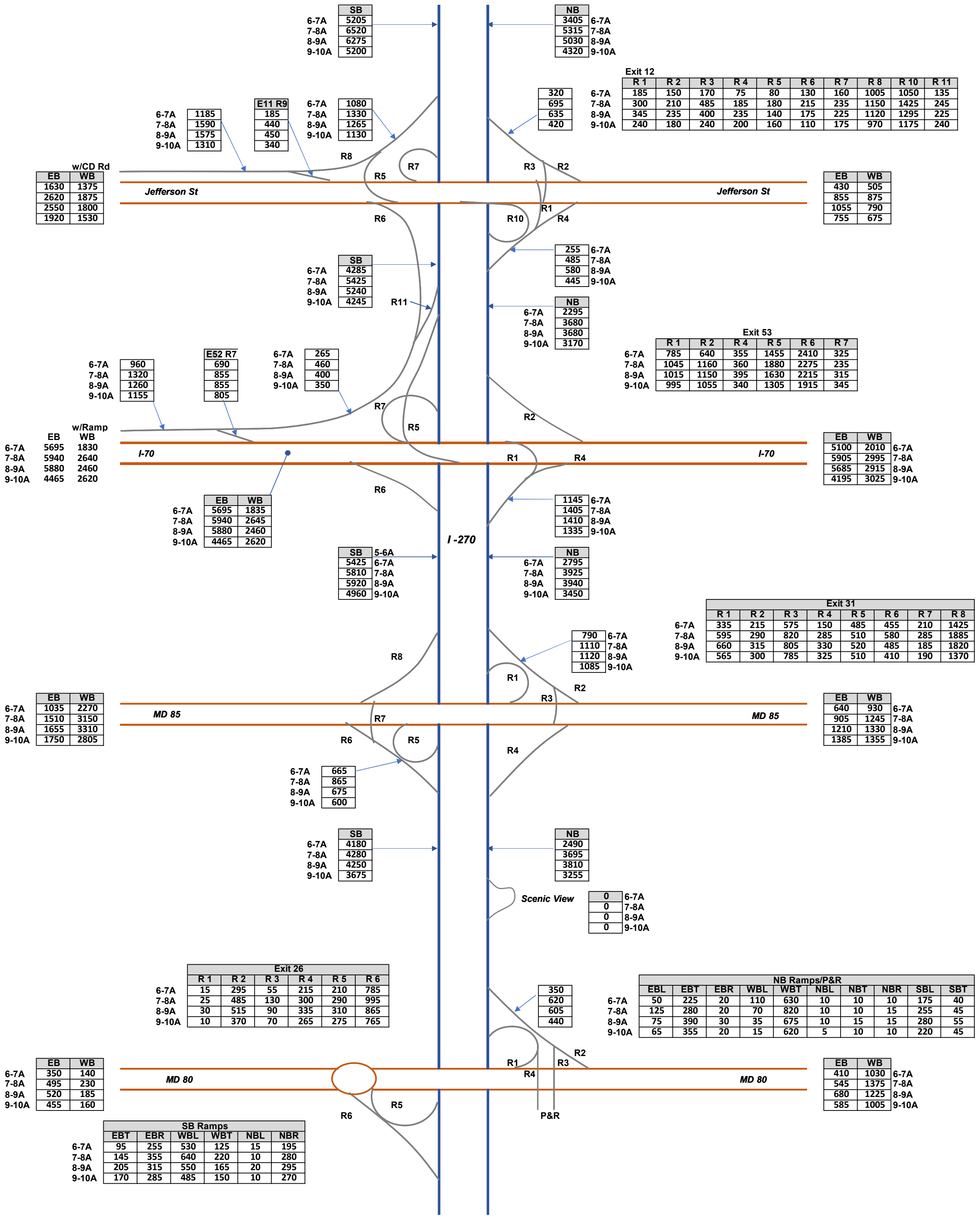
	Exit 7								
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9
3-4P	945	572	275	1015	530	1290	2061	275	114
4-5P	950	653	295	1065	610	1370	2066	295	120
5-6P	885	704	345	1080	550	1375	1905	345	138
6-7P	725	616	285	1100	525	1405	1812	285	150

	I-495	
	SB	NB
3-4P	6608	6775
4-5P	7506	6730
5-6P	7435	6605
6-7P	6649	5770

	MD 337	
	SB	NB
3-4P	1115	1125
4-5P	1400	1160
5-6P	1320	1135
6-7P	1215	935

	MD 5	
	SB	NB
3-4P	5366	3565
4-5P	5981	3455
5-6P	6035	3495
6-7P	5757	3390

I-270 & I-495 West Side AM
Future Alternative No Build Peak Period Volumes



	SB
6-7A	5205
7-8A	6520
8-9A	6275
9-10A	5200

NB	
3405	6-7A
5315	7-8A
5030	8-9A
4320	9-10A

Exit 12

	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 10	R 11
6-7A	185	150	170	75	80	130	160	1005	1050	135
7-8A	300	210	485	185	180	215	235	1150	1425	245
8-9A	345	235	400	235	140	175	225	1120	1295	225
9-10A	240	180	240	200	160	110	175	970	1175	240

320
695
635
420

6-7A	1185
7-8A	1590
8-9A	1575
9-10A	1310

E11 R9
185
440
450
340

6-7A	1080
7-8A	1330
8-9A	1265
9-10A	1130

w/CD Rd

EB	WB
1630	1375
2620	1875
2550	1800
1920	1530

EB	WB
430	505
855	875
1055	790
755	675

255	6-7A
485	7-8A
580	8-9A
445	9-10A

	SB
6-7A	4285
7-8A	5425
8-9A	5240
9-10A	4245

	NB
6-7A	2295
7-8A	3680
8-9A	3680
9-10A	3170

Exit 53

	R 1	R 2	R 4	R 5	R 6	R 7
6-7A	785	640	355	1455	2410	325
7-8A	1045	1160	360	1880	2275	235
8-9A	1015	1150	395	1630	2215	315
9-10A	995	1055	340	1305	1915	345

6-7A	960
7-8A	1320
8-9A	1260
9-10A	1155

E52 R7
690
855
855
805

6-7A	265
7-8A	460
8-9A	400
9-10A	350

w/Ramp

	EB	WB
6-7A	5695	1830
7-8A	5940	2640
8-9A	5880	2460
9-10A	4465	2620

EB	WB	
5100	2010	6-7A
5905	2995	7-8A
5685	2915	8-9A
4195	3025	9-10A

	EB	WB
6-7A	5695	1835
7-8A	5940	2645
8-9A	5880	2460
9-10A	4465	2620

1145	6-7A
1405	7-8A
1410	8-9A
1335	9-10A

SB	5-6A
5425	6-7A
5810	7-8A
5920	8-9A
4960	9-10A

	NB
6-7A	2795
7-8A	3925
8-9A	3940
9-10A	3450

Exit 31

	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	335	215	575	150	485	455	210	1425
7-8A	595	290	820	285	510	580	285	1885
8-9A	660	315	805	330	520	485	185	1820
9-10A	565	300	785	325	510	410	190	1370

790	6-7A
1110	7-8A
1120	8-9A
1085	9-10A

	EB	WB
6-7A	1035	2270
7-8A	1510	3150
8-9A	1655	3310
9-10A	1750	2805

EB	WB	
640	930	6-7A
905	1245	7-8A
1210	1330	8-9A
1385	1355	9-10A

6-7A	665
7-8A	865
8-9A	675
9-10A	600

	SB
6-7A	4180
7-8A	4280
8-9A	4250
9-10A	3675

NB
2490
3695
3810
3255

0	6-7A
0	7-8A
0	8-9A
0	9-10A

Exit 26

	R 1	R 2	R 3	R 4	R 5	R 6
6-7A	15	295	55	215	210	785
7-8A	25	485	130	300	290	995
8-9A	30	515	90	335	310	865
9-10A	10	370	70	265	275	765

350
620
605
440

NB Ramps/P&R

	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
6-7A	50	225	20	110	630	10	10	10	175	40
7-8A	125	280	20	70	820	10	10	15	255	45
8-9A	75	390	30	35	675	10	15	15	280	55
9-10A	65	355	20	15	620	5	10	10	220	45

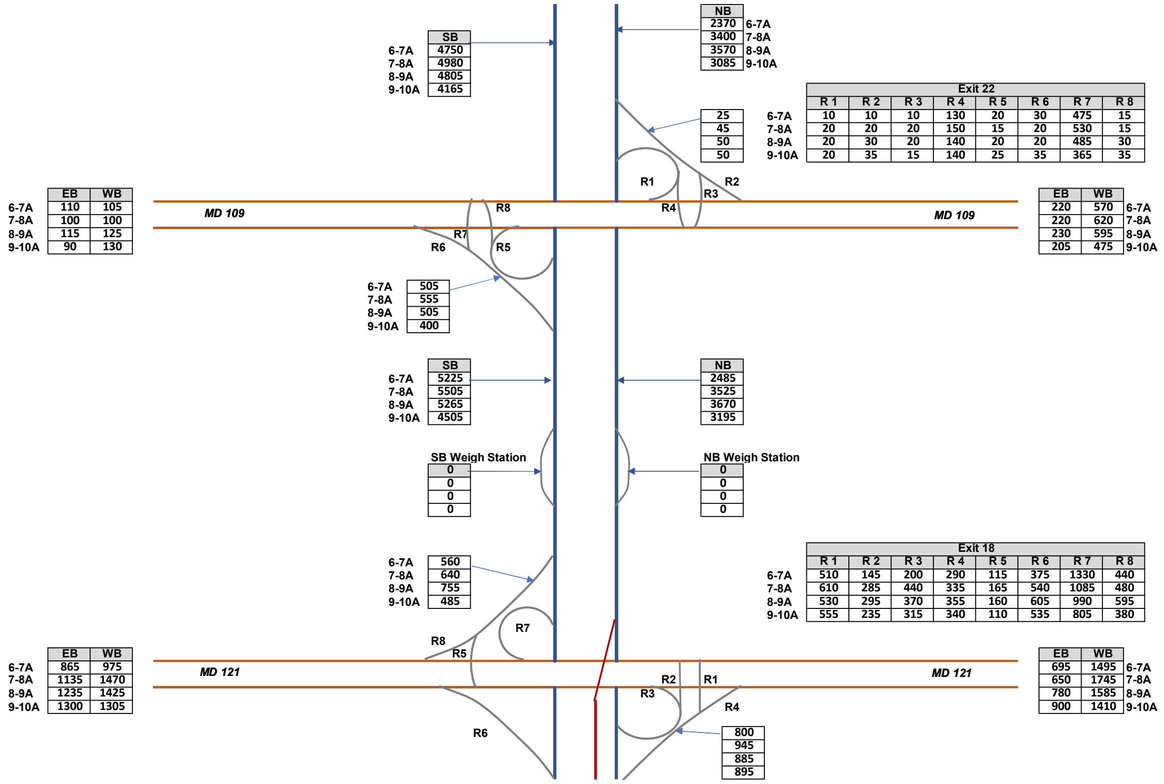
	EB	WB
6-7A	350	140
7-8A	495	230
8-9A	520	185
9-10A	455	160

EB	WB	
410	1030	6-7A
545	1375	7-8A
680	1225	8-9A
585	1005	9-10A

SB Ramps

	EBT	EBR	WBL	WBT	NBL	NBR
6-7A	95	255	530	125	15	195
7-8A	145	355	640	220	10	280
8-9A	205	315	550	165	20	295
9-10A	170	285	485	150	10	270

I-270 & I-495 West Side AM
Future Alternative No Build Peak Period Volumes



	SB
6-7A	4750
7-8A	4980
8-9A	4805
9-10A	4165

NB	
2370	6-7A
3400	7-8A
3570	8-9A
3085	9-10A

25
45
50
50

	Exit 22							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	10	10	10	130	20	30	475	15
7-8A	20	20	20	150	15	20	530	15
8-9A	20	30	20	140	20	20	485	30
9-10A	20	35	15	140	25	35	365	35

	EB	WB
6-7A	110	105
7-8A	100	100
8-9A	115	125
9-10A	90	130

EB	WB	
220	570	6-7A
220	620	7-8A
230	595	8-9A
205	475	9-10A

6-7A	505
7-8A	555
8-9A	505
9-10A	400

	SB
6-7A	5225
7-8A	5505
8-9A	5265
9-10A	4505

NB
2485
3525
3670
3195

SB Weigh Station

0
0
0
0

NB Weigh Station

0
0
0
0

6-7A	560
7-8A	640
8-9A	755
9-10A	485

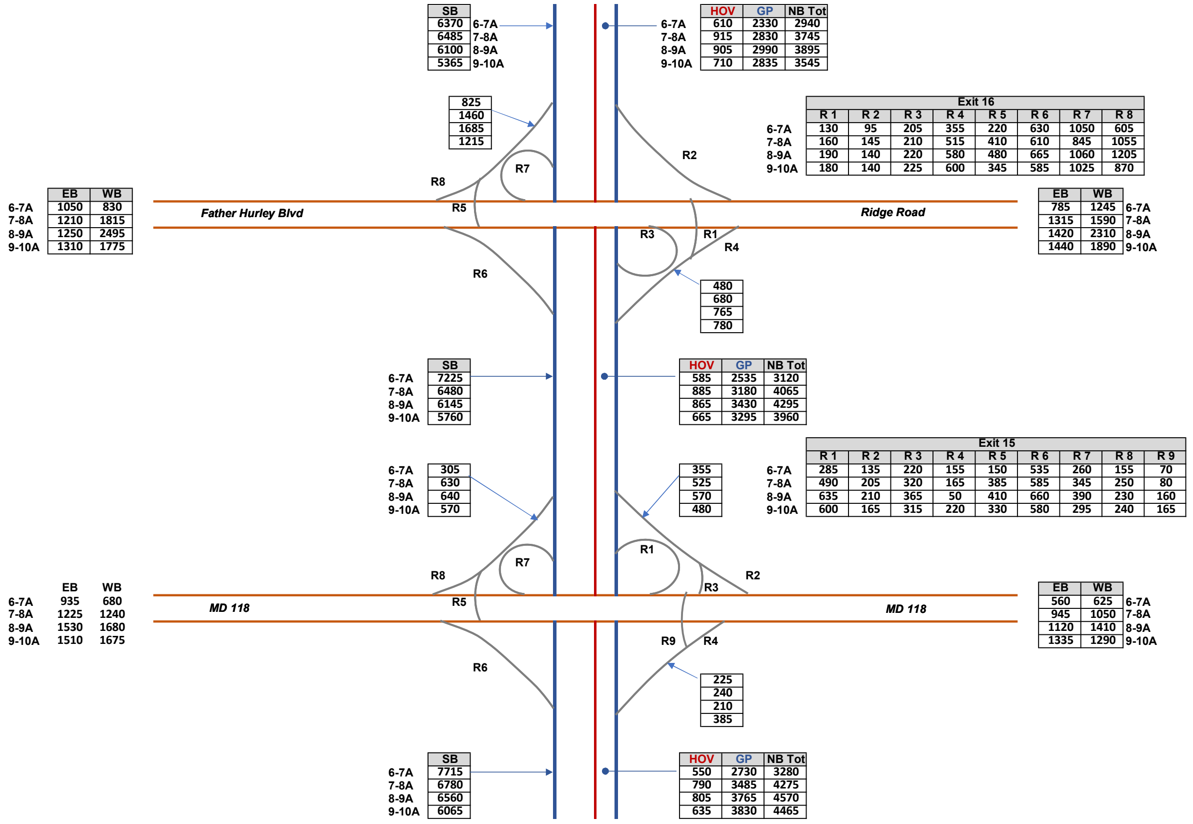
	Exit 18							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	510	145	200	290	115	375	1330	440
7-8A	610	285	440	335	165	540	1085	480
8-9A	530	295	370	355	160	605	990	595
9-10A	555	235	315	340	110	535	805	380

	EB	WB
6-7A	865	975
7-8A	1135	1470
8-9A	1235	1425
9-10A	1300	1305

EB	WB	
695	1495	6-7A
650	1745	7-8A
780	1585	8-9A
900	1410	9-10A

800
945
885
895

I-270 & I-495 West Side AM
Future Alternative No Build Peak Period Volumes



	SB
6-7A	6370
7-8A	6485
8-9A	6100
9-10A	5365

	HOV	GP	NB Tot
6-7A	610	2330	2940
7-8A	915	2830	3745
8-9A	905	2990	3895
9-10A	710	2835	3545

825
1460
1685
1215

	Exit 16							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	130	95	205	355	220	630	1050	605
7-8A	160	145	210	515	410	610	845	1055
8-9A	190	140	220	580	480	665	1060	1205
9-10A	180	140	225	600	345	585	1025	870

	EB	WB
6-7A	1050	830
7-8A	1210	1815
8-9A	1250	2495
9-10A	1310	1775

	EB	WB
6-7A	785	1245
7-8A	1315	1590
8-9A	1420	2310
9-10A	1440	1890

480
680
765
780

	SB
6-7A	7225
7-8A	6480
8-9A	6145
9-10A	5760

	HOV	GP	NB Tot
6-7A	585	2535	3120
7-8A	885	3180	4065
8-9A	865	3430	4295
9-10A	665	3295	3960

6-7A	305
7-8A	630
8-9A	640
9-10A	570

355
525
570
480

	Exit 15								
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9
6-7A	285	135	220	155	150	535	260	155	70
7-8A	490	205	320	165	385	585	345	250	80
8-9A	635	210	365	50	410	660	390	230	160
9-10A	600	165	315	220	330	580	295	240	165

	EB	WB
6-7A	935	680
7-8A	1225	1240
8-9A	1530	1680
9-10A	1510	1675

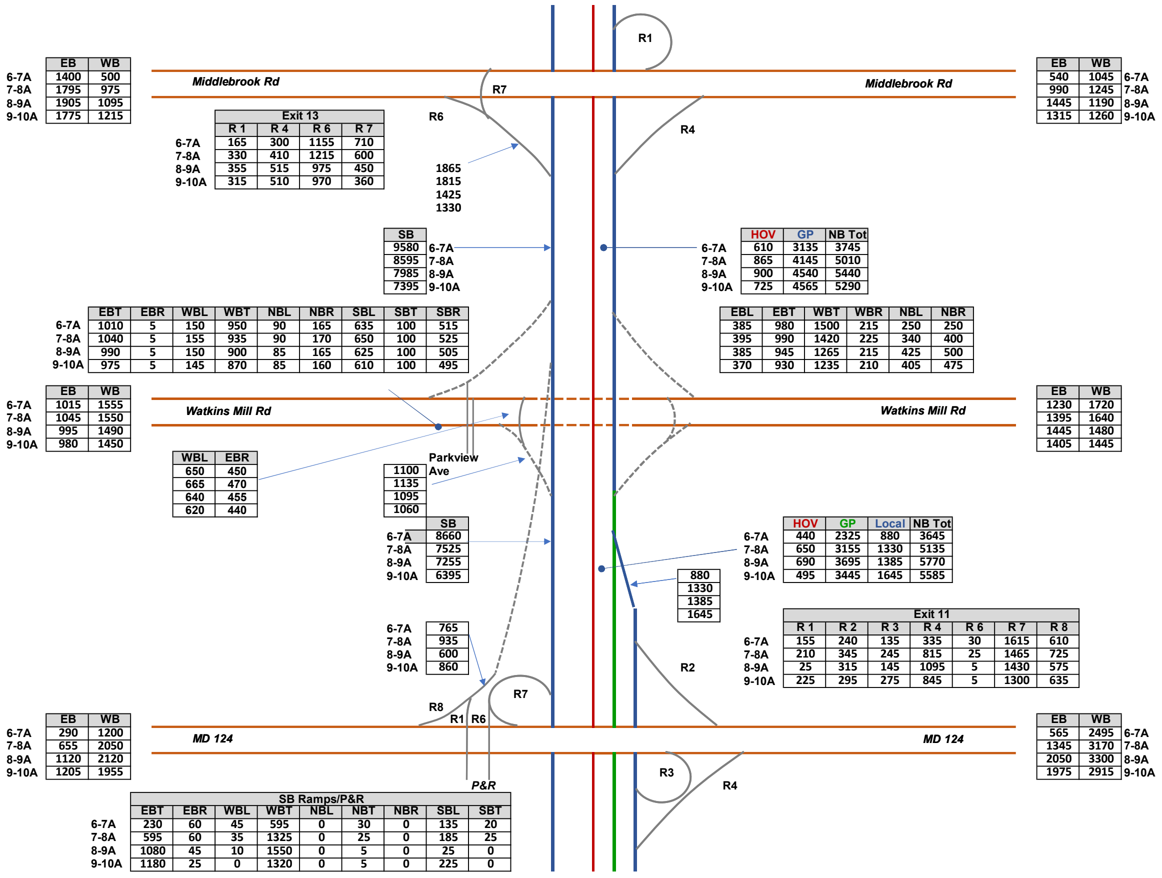
	EB	WB
6-7A	560	625
7-8A	945	1050
8-9A	1120	1410
9-10A	1335	1290

225
240
210
385

	SB
6-7A	7715
7-8A	6780
8-9A	6560
9-10A	6065

	HOV	GP	NB Tot
6-7A	550	2730	3280
7-8A	790	3485	4275
8-9A	805	3765	4570
9-10A	635	3830	4465

I-270 & I-495 West Side AM
Future Alternative No Build Peak Period Volumes



Middlebrook Rd (west)

	EB	WB
6-7A	1400	500
7-8A	1795	975
8-9A	1905	1095
9-10A	1775	1215

Middlebrook Rd (east)

EB	WB	
540	1045	6-7A
990	1245	7-8A
1445	1190	8-9A
1315	1260	9-10A

	Exit 13			
	R 1	R 4	R 6	R 7
6-7A	165	300	1155	710
7-8A	330	410	1215	600
8-9A	355	515	975	450
9-10A	315	510	970	360

1865
1815
1425
1330

SB	
9580	6-7A
8595	7-8A
7985	8-9A
7395	9-10A

	HOV	GP	NB Tot
6-7A	610	3135	3745
7-8A	865	4145	5010
8-9A	900	4540	5440
9-10A	725	4565	5290

	EBT	EBR	WBL	WBT	NBL	NBR	SBL	SBT	SBR
6-7A	1010	5	150	950	90	165	635	100	515
7-8A	1040	5	155	935	90	170	650	100	525
8-9A	990	5	150	900	85	165	625	100	505
9-10A	975	5	145	870	85	160	610	100	495

EBL	EBT	WBT	WBR	NBL	NBR
385	980	1500	215	250	250
395	990	1420	225	340	400
385	945	1265	215	425	500
370	930	1235	210	405	475

Watkins Mill Rd (west)

	EB	WB
6-7A	1015	1555
7-8A	1045	1550
8-9A	995	1490
9-10A	980	1450

Watkins Mill Rd (east)

EB	WB
1230	1720
1395	1640
1445	1480
1405	1445

WBL	EBR
650	450
665	470
640	455
620	440

Parkview Ave

1100
1135
1095
1060

	SB
6-7A	8660
7-8A	7525
8-9A	7255
9-10A	6395

	HOV	GP	Local	NB Tot
6-7A	440	2325	880	3645
7-8A	650	3155	1330	5135
8-9A	690	3695	1385	5770
9-10A	495	3445	1645	5585

880
1330
1385
1645

6-7A	765
7-8A	935
8-9A	600
9-10A	860

	Exit 11						
	R 1	R 2	R 3	R 4	R 6	R 7	R 8
6-7A	155	240	135	335	30	1615	610
7-8A	210	345	245	815	25	1465	725
8-9A	25	315	145	1095	5	1430	575
9-10A	225	295	275	845	5	1300	635

MD 124 (west)

	EB	WB
6-7A	290	1200
7-8A	655	2050
8-9A	1120	2120
9-10A	1205	1955

MD 124 (east)

EB	WB	
565	2495	6-7A
1345	3170	7-8A
2050	3300	8-9A
1975	2915	9-10A

	SB Ramps/P&R								
	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
6-7A	230	60	45	595	0	30	0	135	20
7-8A	595	60	35	1325	0	25	0	185	25
8-9A	1080	45	10	1550	0	5	0	25	0
9-10A	1180	25	0	1320	0	5	0	225	0

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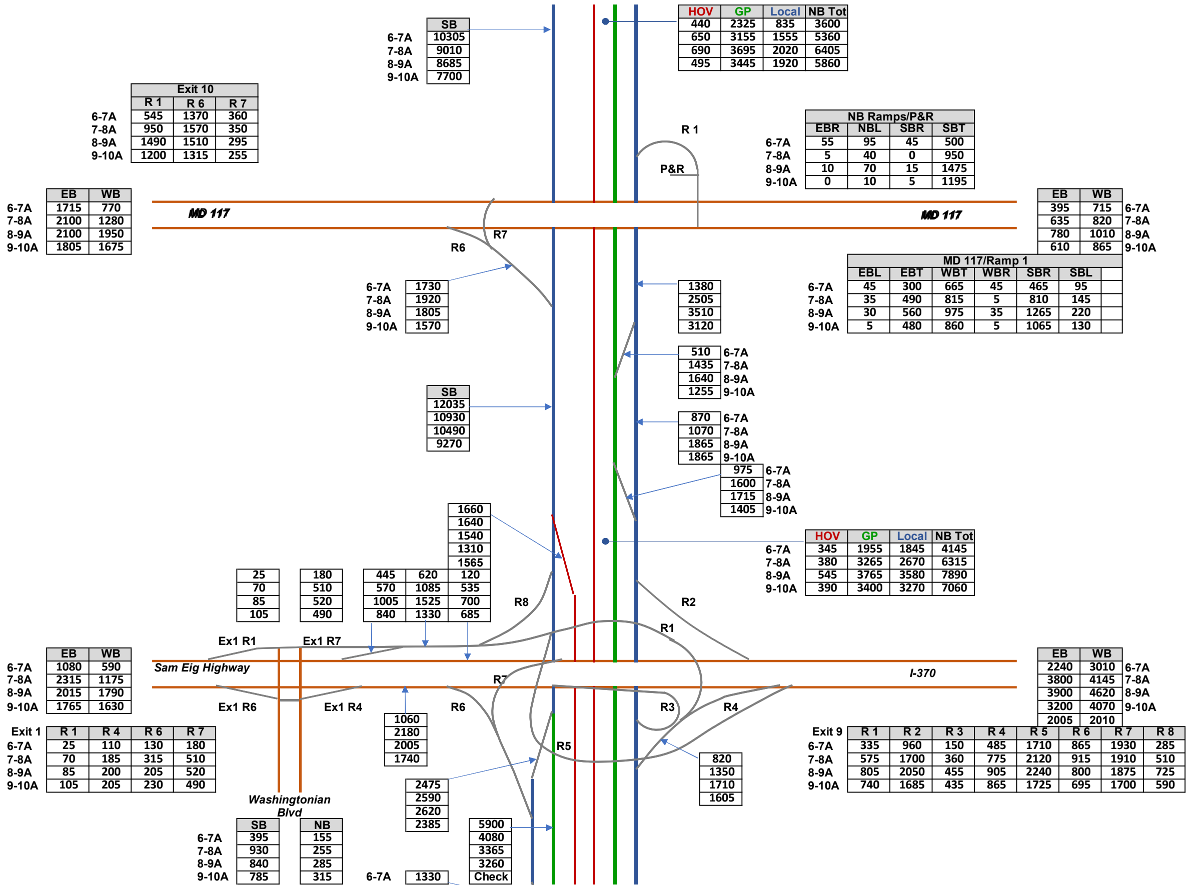


	SB
6-7A	10305
7-8A	9010
8-9A	8685
9-10A	7700

HOV	GP	Local	NB Tot
440	2325	835	3600
650	3155	1555	5360
690	3695	2020	6405
495	3445	1920	5860

	Exit 10		
	R 1	R 6	R 7
6-7A	545	1370	360
7-8A	950	1570	350
8-9A	1490	1510	295
9-10A	1200	1315	255

	NB Ramps/P&R			
	EBR	NBL	SBR	SBT
6-7A	55	95	45	500
7-8A	5	40	0	950
8-9A	10	70	15	1475
9-10A	0	10	5	1195

	EB	WB
6-7A	1715	770
7-8A	2100	1280
8-9A	2100	1950
9-10A	1805	1675

EB	WB	
395	715	6-7A
635	820	7-8A
780	1010	8-9A
610	865	9-10A

	MD 117/Ramp 1						
	EBL	EBT	WBT	WBR	SBR	SBL	
6-7A	45	300	665	45	465	95	
7-8A	35	490	815	5	810	145	
8-9A	30	560	975	35	1265	220	
9-10A	5	480	860	5	1065	130	

6-7A	1730
7-8A	1920
8-9A	1805
9-10A	1570

1380
2505
3510
3120

510	6-7A
1435	7-8A
1640	8-9A
1255	9-10A

SB
12035
10930
10490
9270

870	6-7A
1070	7-8A
1865	8-9A
1865	9-10A

975	6-7A
1600	7-8A
1715	8-9A
1405	9-10A

1660
1640
1540
1310
1565

	HOV	GP	Local	NB Tot
6-7A	345	1955	1845	4145
7-8A	380	3265	2670	6315
8-9A	545	3765	3580	7890
9-10A	390	3400	3270	7060

25
70
85
105

180
510
520
490

445	620	120
570	1085	535
1005	1525	700
840	1330	685

	EB	WB
6-7A	1080	590
7-8A	2315	1175
8-9A	2015	1790
9-10A	1765	1630

EB	WB	
2240	3010	6-7A
3800	4145	7-8A
3900	4620	8-9A
3200	4070	9-10A
2005	2010	

Exit 1	R 1	R 4	R 6	R 7
6-7A	25	110	130	180
7-8A	70	185	315	510
8-9A	85	200	205	520
9-10A	105	205	230	490

1060
2180
2005
1740

820
1350
1710
1605

Exit 9	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	335	960	150	485	1710	865	1930	285
7-8A	575	1700	360	775	2120	915	1910	510
8-9A	805	2050	455	905	2240	800	1875	725
9-10A	740	1685	435	865	1725	695	1700	590

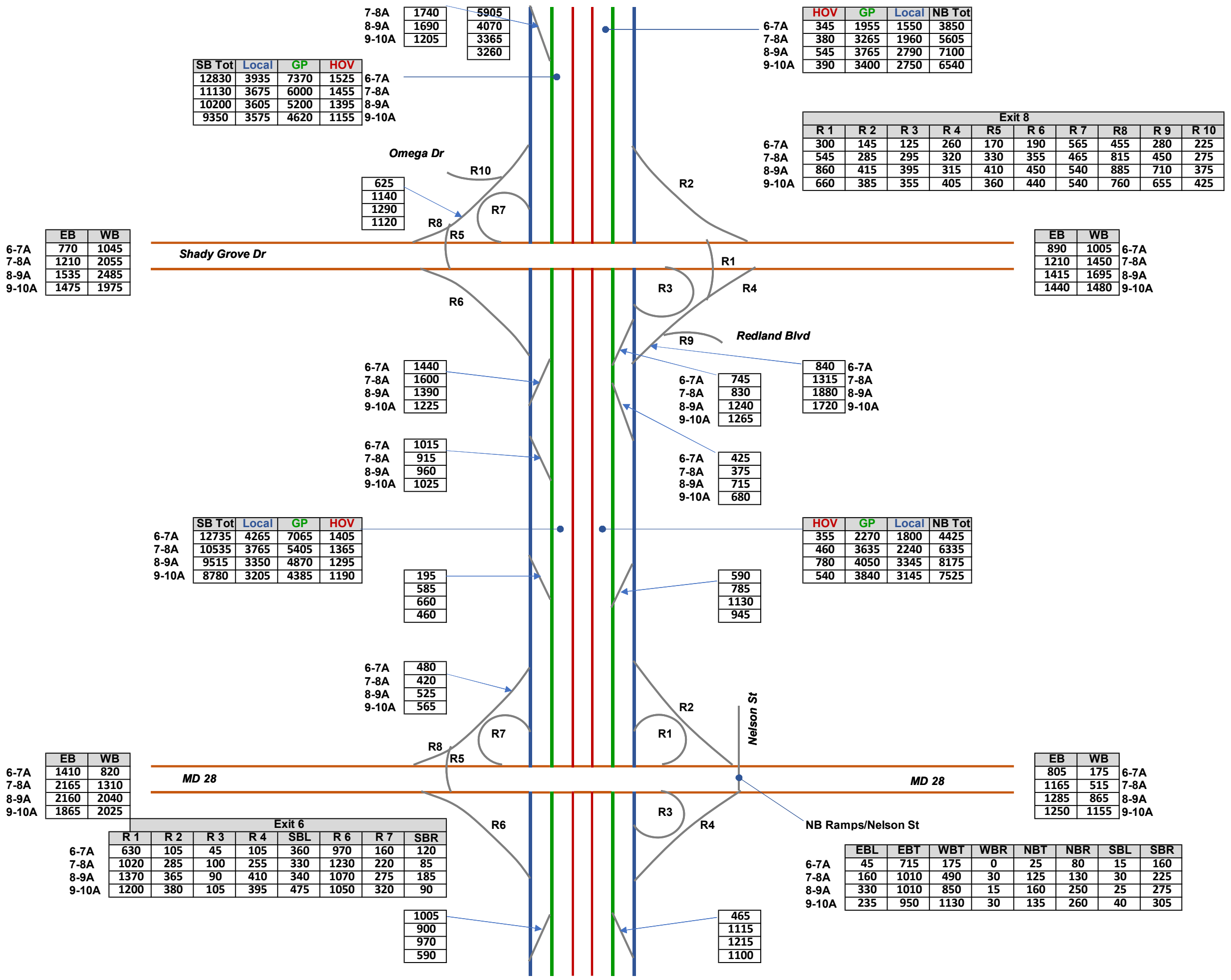
2475
2590
2620
2385

	SB	NB
6-7A	395	155
7-8A	930	255
8-9A	840	285
9-10A	785	315

6-7A	1330

5900
4080
3365
3260
Check

I-270 & I-495 West Side AM
Future Alternative No Build Peak Period Volumes



7-8A	1740
8-9A	1690
9-10A	1205

5905
4070
3365
3260

	HOV	GP	Local	NB Tot
6-7A	345	1955	1550	3850
7-8A	380	3265	1960	5605
8-9A	545	3765	2790	7100
9-10A	390	3400	2750	6540

SB Tot	Local	GP	HOV	
12830	3935	7370	1525	6-7A
11130	3675	6000	1455	7-8A
10200	3605	5200	1395	8-9A
9350	3575	4620	1155	9-10A

	Exit 8									
	R 1	R 2	R 3	R 4	R5	R 6	R 7	R8	R 9	R 10
6-7A	300	145	125	260	170	190	565	455	280	225
7-8A	545	285	295	320	330	355	465	815	450	275
8-9A	860	415	395	315	410	450	540	885	710	375
9-10A	660	385	355	405	360	440	540	760	655	425

625
1140
1290
1120

	EB	WB
6-7A	770	1045
7-8A	1210	2055
8-9A	1535	2485
9-10A	1475	1975

EB	WB	
890	1005	6-7A
1210	1450	7-8A
1415	1695	8-9A
1440	1480	9-10A

6-7A	1440
7-8A	1600
8-9A	1390
9-10A	1225

840	6-7A
1315	7-8A
1880	8-9A
1720	9-10A

6-7A	745
7-8A	830
8-9A	1240
9-10A	1265

6-7A	1015
7-8A	915
8-9A	960
9-10A	1025

6-7A	425
7-8A	375
8-9A	715
9-10A	680

	SB Tot	Local	GP	HOV
6-7A	12735	4265	7065	1405
7-8A	10535	3765	5405	1365
8-9A	9515	3350	4870	1295
9-10A	8780	3205	4385	1190

HOV	GP	Local	NB Tot
355	2270	1800	4425
460	3635	2240	6335
780	4050	3345	8175
540	3840	3145	7525

195
585
660
460

590
785
1130
945

6-7A	480
7-8A	420
8-9A	525
9-10A	565

	EB	WB
6-7A	1410	820
7-8A	2165	1310
8-9A	2160	2040
9-10A	1865	2025

EB	WB	
805	175	6-7A
1165	515	7-8A
1285	865	8-9A
1250	1155	9-10A

	Exit 6							
	R 1	R 2	R 3	R 4	SBL	R 6	R 7	SBR
6-7A	630	105	45	105	360	970	160	120
7-8A	1020	285	100	255	330	1230	220	85
8-9A	1370	365	90	410	340	1070	275	185
9-10A	1200	380	105	395	475	1050	320	90

	EBL	EBT	WBT	WBR	NBT	NBR	SBL	SBR
6-7A	45	715	175	0	25	80	15	160
7-8A	160	1010	490	30	125	130	30	225
8-9A	330	1010	850	15	160	250	25	275
9-10A	235	950	1130	30	135	260	40	305

1005
900
970
590

465
1115
1215
1100

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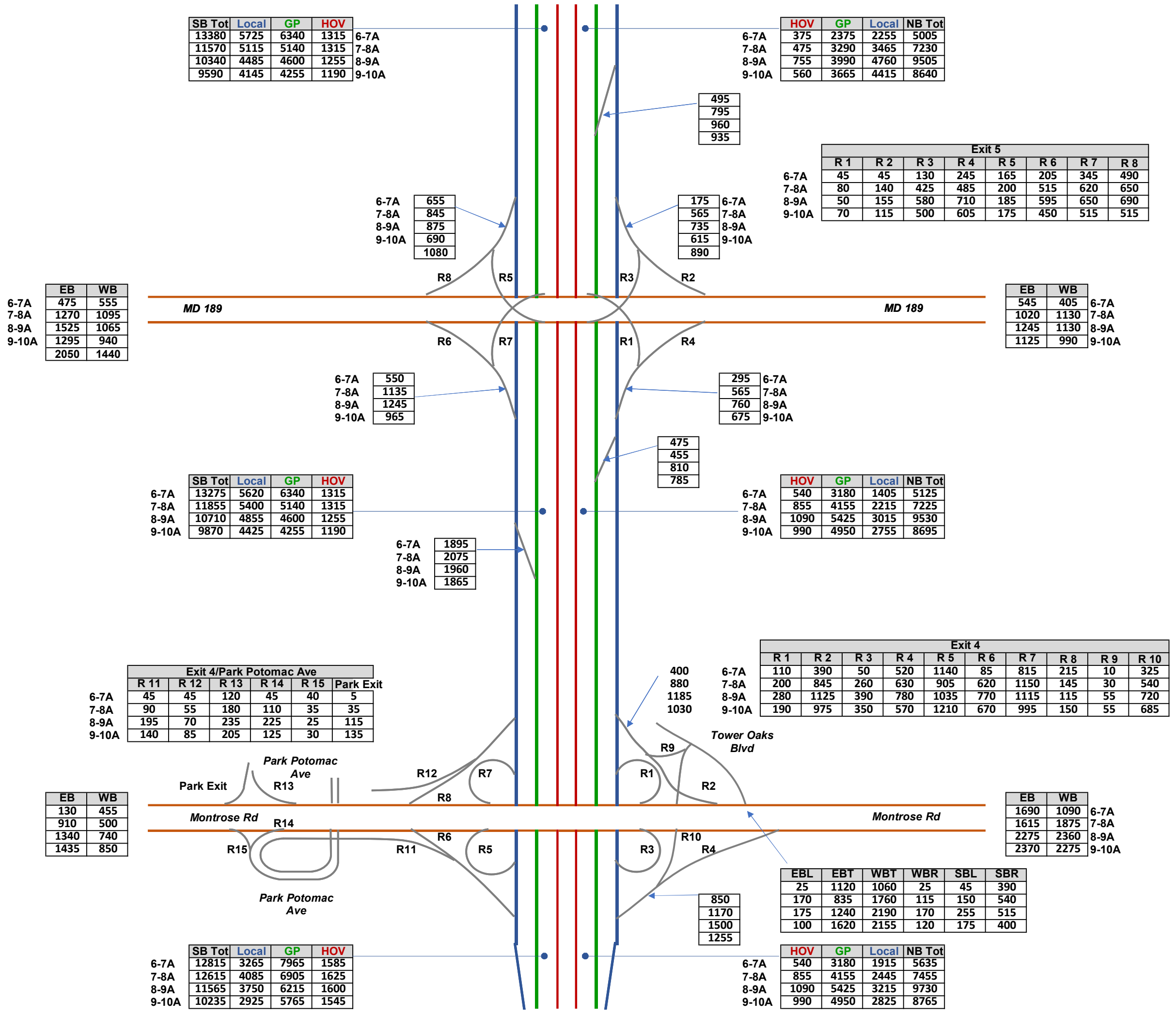

SB Tot	Local	GP	HOV	
13380	5725	6340	1315	6-7A
11570	5115	5140	1315	7-8A
10340	4485	4600	1255	8-9A
9590	4145	4255	1190	9-10A

	HOV	GP	Local	NB Tot
6-7A	375	2375	2255	5005
7-8A	475	3290	3465	7230
8-9A	755	3990	4760	9505
9-10A	560	3665	4415	8640

495
795
960
935

	Exit 5							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	45	45	130	245	165	205	345	490
7-8A	80	140	425	485	200	515	620	650
8-9A	50	155	580	710	185	595	650	690
9-10A	70	115	500	605	175	450	515	515

6-7A	655
7-8A	845
8-9A	875
9-10A	690
	1080

175	6-7A
565	7-8A
735	8-9A
615	9-10A
890	

	EB	WB
6-7A	475	555
7-8A	1270	1095
8-9A	1525	1065
9-10A	1295	940
	2050	1440

EB	WB	
545	405	6-7A
1020	1130	7-8A
1245	1130	8-9A
1125	990	9-10A

6-7A	550
7-8A	1135
8-9A	1245
9-10A	965

295	6-7A
565	7-8A
760	8-9A
675	9-10A

475
455
810
785

	SB Tot	Local	GP	HOV
6-7A	13275	5620	6340	1315
7-8A	11855	5400	5140	1315
8-9A	10710	4855	4600	1255
9-10A	9870	4425	4255	1190

	HOV	GP	Local	NB Tot
6-7A	540	3180	1405	5125
7-8A	855	4155	2215	7225
8-9A	1090	5425	3015	9530
9-10A	990	4950	2755	8695

6-7A	1895
7-8A	2075
8-9A	1960
9-10A	1865

	Exit 4									
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10
6-7A	110	390	50	520	1140	85	815	215	10	325
7-8A	200	845	260	630	905	620	1150	145	30	540
8-9A	280	1125	390	780	1035	770	1115	115	55	720
9-10A	190	975	350	570	1210	670	995	150	55	685

	Exit 4/Park Potomac Ave					
	R 11	R 12	R 13	R 14	R 15	Park Exit
6-7A	45	45	120	45	40	5
7-8A	90	55	180	110	35	35
8-9A	195	70	235	225	25	115
9-10A	140	85	205	125	30	135

400	6-7A
880	7-8A
1185	8-9A
1030	9-10A

EB	WB
130	455
910	500
1340	740
1435	850

EB	WB	
1690	1090	6-7A
1615	1875	7-8A
2275	2360	8-9A
2370	2275	9-10A

EBL	EBT	WBT	WBR	SBL	SBR
25	1120	1060	25	45	390
170	835	1760	115	150	540
175	1240	2190	170	255	515
100	1620	2155	120	175	400

850
1170
1500
1255

	SB Tot	Local	GP	HOV
6-7A	12815	3265	7965	1585
7-8A	12615	4085	6905	1625
8-9A	11565	3750	6215	1600
9-10A	10235	2925	5765	1545

	HOV	GP	Local	NB Tot
6-7A	540	3180	1915	5635
7-8A	855	4155	2445	7455
8-9A	1090	5425	3215	9730
9-10A	990	4950	2825	8765

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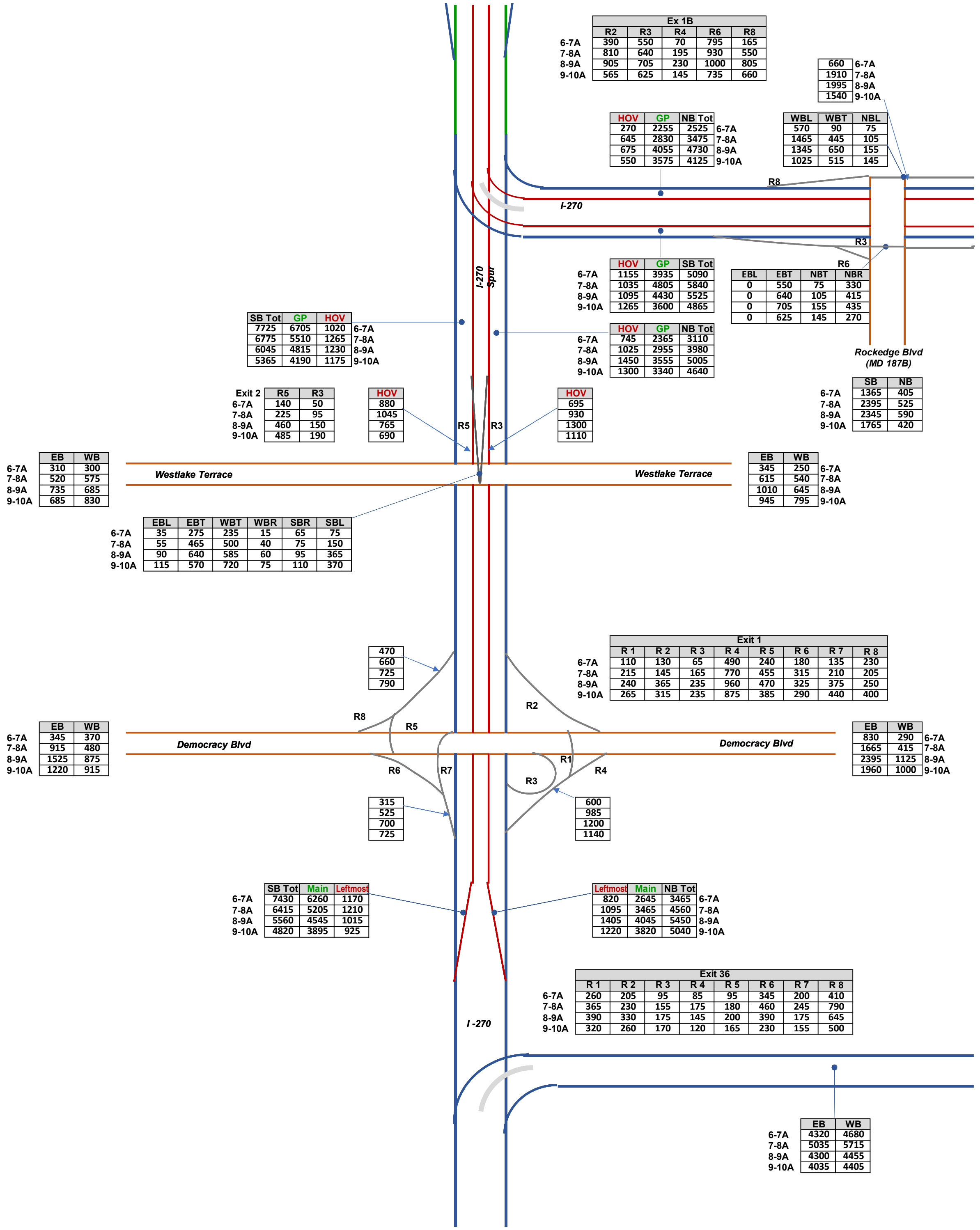


Ex 1B	R2	R3	R4	R6	R8
6-7A	390	550	70	795	165
7-8A	810	640	195	930	550
8-9A	905	705	230	1000	805
9-10A	565	625	145	735	660

660	6-7A
1910	7-8A
1995	8-9A
1540	9-10A

HOV	GP	NB Tot	
270	2255	2525	6-7A
645	2830	3475	7-8A
675	4055	4730	8-9A
550	3575	4125	9-10A

WBL	WBT	NBL
570	90	75
1465	445	105
1345	650	155
1025	515	145

	HOV	GP	SB Tot
6-7A	1155	3935	5090
7-8A	1035	4805	5840
8-9A	1095	4430	5525
9-10A	1265	3600	4865

EBL	EBT	NBT	NBR
0	550	75	330
0	640	105	415
0	705	155	435
0	625	145	270

SB Tot	GP	HOV	
7725	6705	1020	6-7A
6775	5510	1265	7-8A
6045	4815	1230	8-9A
5365	4190	1175	9-10A

	HOV	GP	NB Tot
6-7A	745	2365	3110
7-8A	1025	2955	3980
8-9A	1450	3555	5005
9-10A	1300	3340	4640

Exit 2	R5	R3
6-7A	140	50
7-8A	225	95
8-9A	460	150
9-10A	485	190

HOV
880
1045
765
690

HOV
695
930
1300
1110

	SB	NB
6-7A	1365	405
7-8A	2395	525
8-9A	2345	590
9-10A	1765	420

	EB	WB
6-7A	310	300
7-8A	520	575
8-9A	735	685
9-10A	685	830

EB	WB	
345	250	6-7A
615	540	7-8A
1010	645	8-9A
945	795	9-10A

	EBL	EBT	WBT	WBR	SBR	SBL
6-7A	35	275	235	15	65	75
7-8A	55	465	500	40	75	150
8-9A	90	640	585	60	95	365
9-10A	115	570	720	75	110	370

470	
660	
725	
790	

	Exit 1							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	110	130	65	490	240	180	135	230
7-8A	215	145	165	770	455	315	210	205
8-9A	240	365	235	960	470	325	375	250
9-10A	265	315	235	875	385	290	440	400

	EB	WB
6-7A	345	370
7-8A	915	480
8-9A	1525	875
9-10A	1220	915

EB	WB	
830	290	6-7A
1665	415	7-8A
2395	1125	8-9A
1960	1000	9-10A

315
525
700
725

600
985
1200
1140

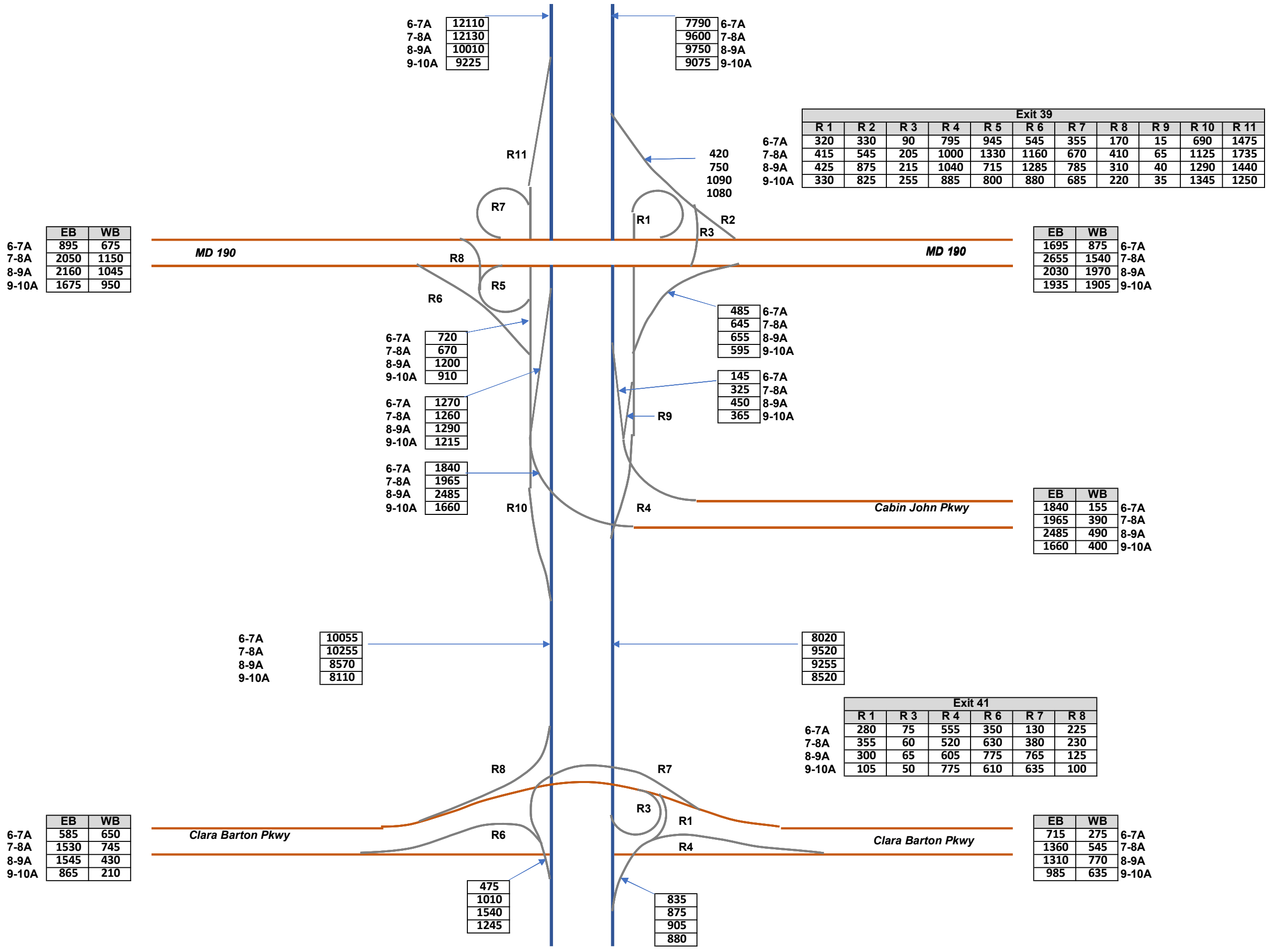
	SB Tot	Main	Leftmost
6-7A	7430	6260	1170
7-8A	6415	5205	1210
8-9A	5560	4545	1015
9-10A	4820	3895	925

Leftmost	Main	NB Tot	
820	2645	3465	6-7A
1095	3465	4560	7-8A
1405	4045	5450	8-9A
1220	3820	5040	9-10A

	Exit 36							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	260	205	95	85	95	345	200	410
7-8A	365	230	155	175	180	460	245	790
8-9A	390	330	175	145	200	390	175	645
9-10A	320	260	170	120	165	230	155	500

	EB	WB
6-7A	4320	4680
7-8A	5035	5715
8-9A	4300	4455
9-10A	4035	4405

I-270 & I-495 West Side AM
Future Alternative No Build Peak Period Volumes



	Exit 39										
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11
6-7A	320	330	90	795	945	545	355	170	15	690	1475
7-8A	415	545	205	1000	1330	1160	670	410	65	1125	1735
8-9A	425	875	215	1040	715	1285	785	310	40	1290	1440
9-10A	330	825	255	885	800	880	685	220	35	1345	1250

	EB	WB
6-7A	895	675
7-8A	2050	1150
8-9A	2160	1045
9-10A	1675	950

EB	WB	
1695	875	6-7A
2655	1540	7-8A
2030	1970	8-9A
1935	1905	9-10A

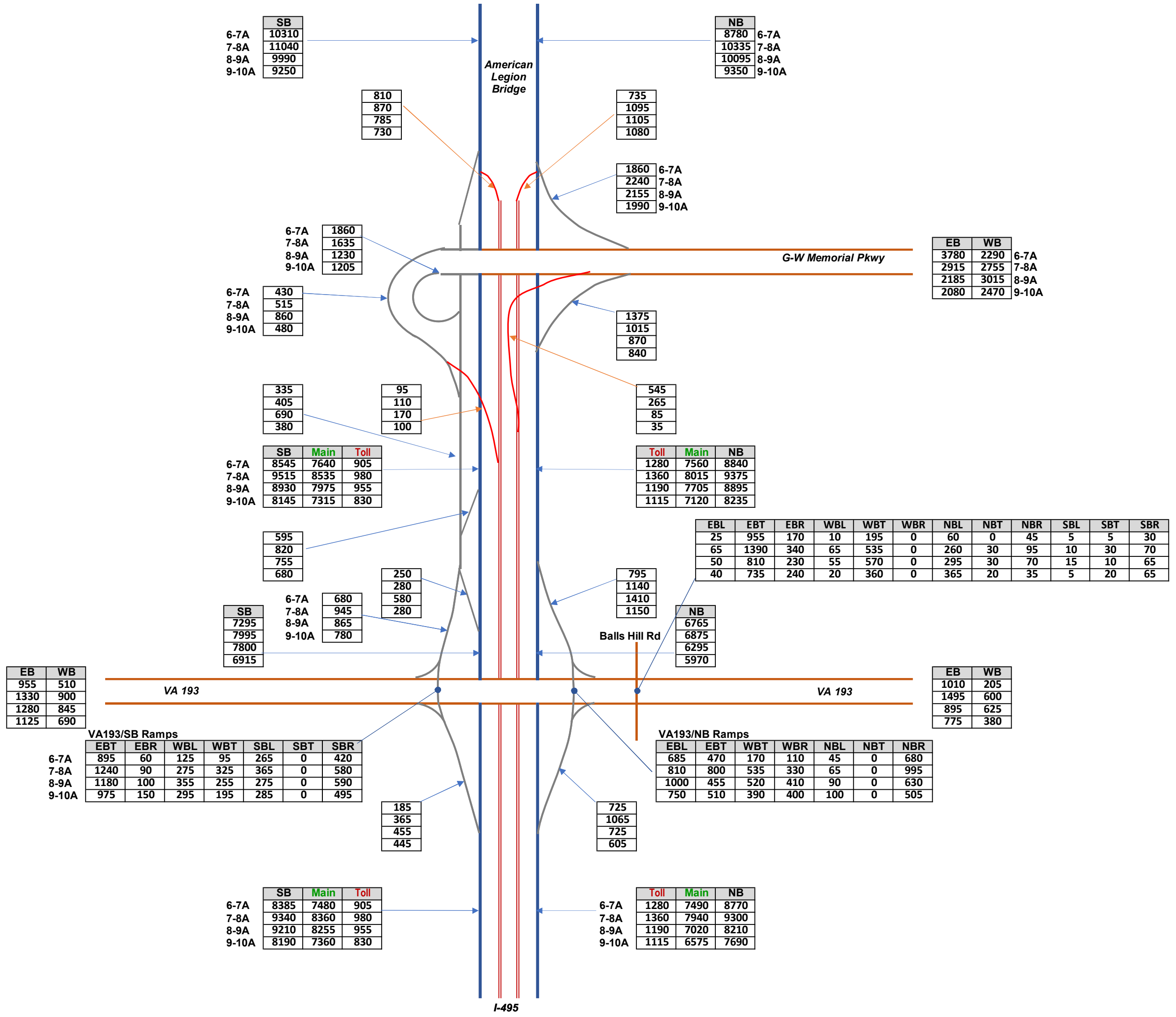
EB	WB	
1840	155	6-7A
1965	390	7-8A
2485	490	8-9A
1660	400	9-10A

	Exit 41					
	R 1	R 3	R 4	R 6	R 7	R 8
6-7A	280	75	555	350	130	225
7-8A	355	60	520	630	380	230
8-9A	300	65	605	775	765	125
9-10A	105	50	775	610	635	100

	EB	WB
6-7A	585	650
7-8A	1530	745
8-9A	1545	430
9-10A	865	210

EB	WB	
715	275	6-7A
1360	545	7-8A
1310	770	8-9A
985	635	9-10A

I-270 & I-495 West Side AM
Future Alternative No Build Peak Period Volumes



	SB
6-7A	10310
7-8A	11040
8-9A	9990
9-10A	9250

NB	
8780	6-7A
10335	7-8A
10095	8-9A
9350	9-10A

EB	WB	
3780	2290	6-7A
2915	2755	7-8A
2185	3015	8-9A
2080	2470	9-10A

	SB	Main	Toll
6-7A	8545	7640	905
7-8A	9515	8535	980
8-9A	8930	7975	955
9-10A	8145	7315	830

Toll	Main	NB
1280	7560	8840
1360	8015	9375
1190	7705	8895
1115	7120	8235

EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
25	955	170	10	195	0	60	0	45	5	5	30
65	1390	340	65	535	0	260	30	95	10	30	70
50	810	230	55	570	0	295	30	70	15	10	65
40	735	240	20	360	0	365	20	35	5	20	65

SB
7295
7995
7800
6915

NB
6765
6875
6295
5970

EB	WB
955	510
1330	900
1280	845
1125	690

EB	WB
1010	205
1495	600
895	625
775	380

VA193/SB Ramps

	EBT	EBR	WBL	WBT	SBL	SBT	SBR
6-7A	895	60	125	95	265	0	420
7-8A	1240	90	275	325	365	0	580
8-9A	1180	100	355	255	275	0	590
9-10A	975	150	295	195	285	0	495

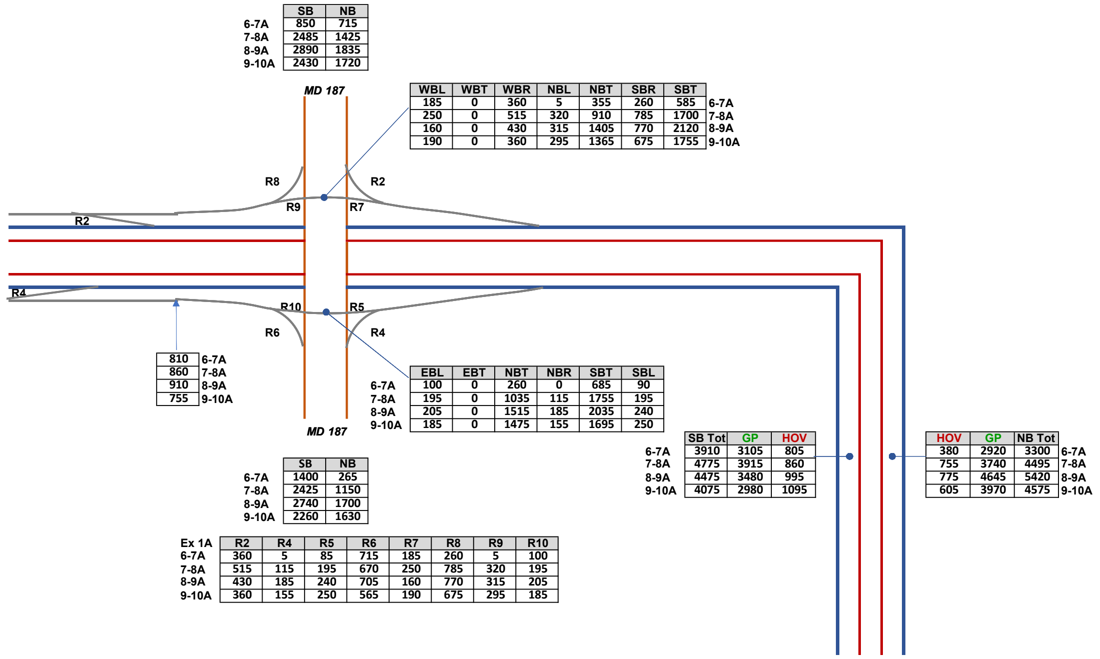
VA193/NB Ramps

EBL	EBT	WBT	WBR	NBL	NBT	NBR
685	470	170	110	45	0	680
810	800	535	330	65	0	995
1000	455	520	410	90	0	630
750	510	390	400	100	0	505

	SB	Main	Toll
6-7A	8385	7480	905
7-8A	9340	8360	980
8-9A	9210	8255	955
9-10A	8190	7360	830

	Toll	Main	NB
6-7A	1280	7490	8770
7-8A	1360	7940	9300
8-9A	1190	7020	8210
9-10A	1115	6575	7690

I-270 & I-495 West Side AM
Future Alternative No Build Peak Period Volumes



	SB	NB
6-7A	850	715
7-8A	2485	1425
8-9A	2890	1835
9-10A	2430	1720

WBL	WBT	WBR	NBL	NBT	SBR	SBT	
185	0	360	5	355	260	585	6-7A
250	0	515	320	910	785	1700	7-8A
160	0	430	315	1405	770	2120	8-9A
190	0	360	295	1365	675	1755	9-10A

810	6-7A
860	7-8A
910	8-9A
755	9-10A

	EBL	EBT	NBT	NBR	SBT	SBL
6-7A	100	0	260	0	685	90
7-8A	195	0	1035	115	1755	195
8-9A	205	0	1515	185	2035	240
9-10A	185	0	1475	155	1695	250

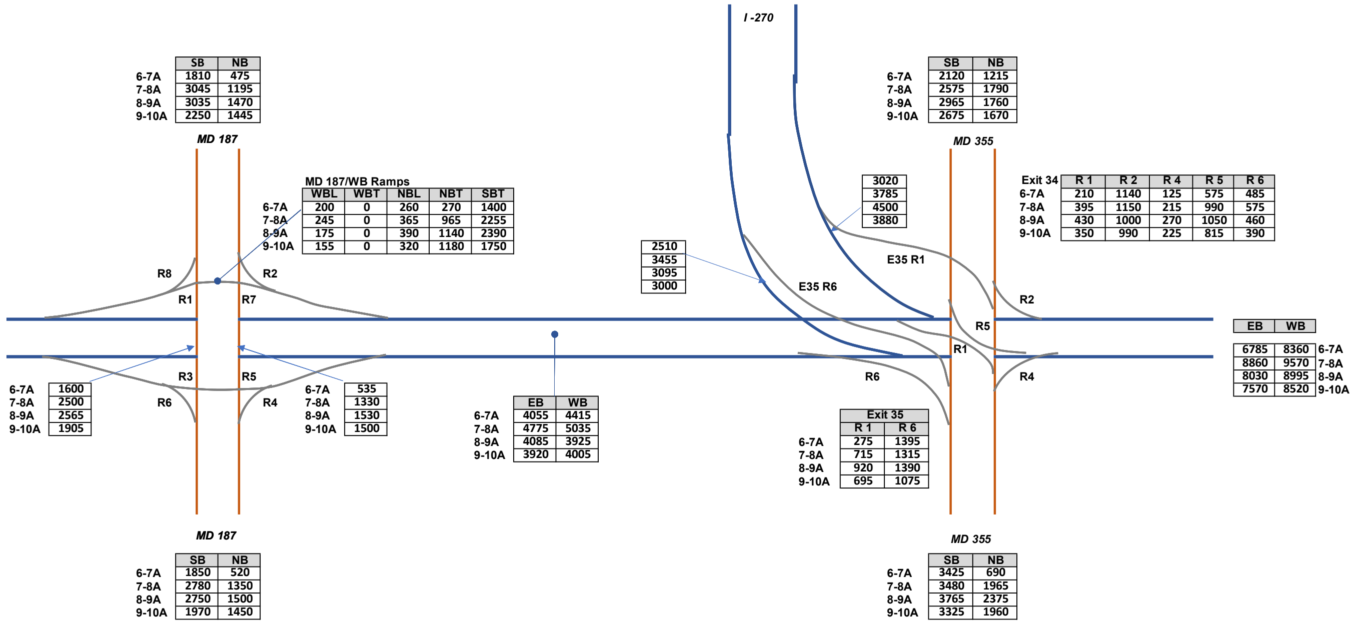
	SB Tot	GP	HOV
6-7A	3910	3105	805
7-8A	4775	3915	860
8-9A	4475	3480	995
9-10A	4075	2980	1095

HOV	GP	NB Tot	
380	2920	3300	6-7A
755	3740	4495	7-8A
775	4645	5420	8-9A
605	3970	4575	9-10A

	SB	NB
6-7A	1400	265
7-8A	2425	1150
8-9A	2740	1700
9-10A	2260	1630

Ex 1A	R2	R4	R5	R6	R7	R8	R9	R10
6-7A	360	5	85	715	185	260	5	100
7-8A	515	115	195	670	250	785	320	195
8-9A	430	185	240	705	160	770	315	205
9-10A	360	155	250	565	190	675	295	185

I-270 & I-495 West Side AM
Future Alternative No Build Peak Period Volumes



MD 187 (north)

	SB	NB
6-7A	1810	475
7-8A	3045	1195
8-9A	3035	1470
9-10A	2250	1445

MD 187/WB Ramps

	WBL	WBT	NBL	NBT	SBT
6-7A	200	0	260	270	1400
7-8A	245	0	365	965	2255
8-9A	175	0	390	1140	2390
9-10A	155	0	320	1180	1750

6-7A	1600
7-8A	2500
8-9A	2565
9-10A	1905

6-7A	535
7-8A	1330
8-9A	1530
9-10A	1500

	EB	WB
6-7A	4055	4415
7-8A	4775	5035
8-9A	4085	3925
9-10A	3920	4005

MD 187 (south)

	SB	NB
6-7A	1850	520
7-8A	2780	1350
8-9A	2750	1500
9-10A	1970	1450

2510
3455
3095
3000

3020
3785
4500
3880

MD 355 (north)

	SB	NB
6-7A	2120	1215
7-8A	2575	1790
8-9A	2965	1760
9-10A	2675	1670

Exit 34	R 1	R 2	R 4	R 5	R 6
6-7A	210	1140	125	575	485
7-8A	395	1150	215	990	575
8-9A	430	1000	270	1050	460
9-10A	350	990	225	815	390

EB	WB	
6785	8360	6-7A
8860	9570	7-8A
8030	8995	8-9A
7570	8520	9-10A

	Exit 35	
	R 1	R 6
6-7A	275	1395
7-8A	715	1315
8-9A	920	1390
9-10A	695	1075

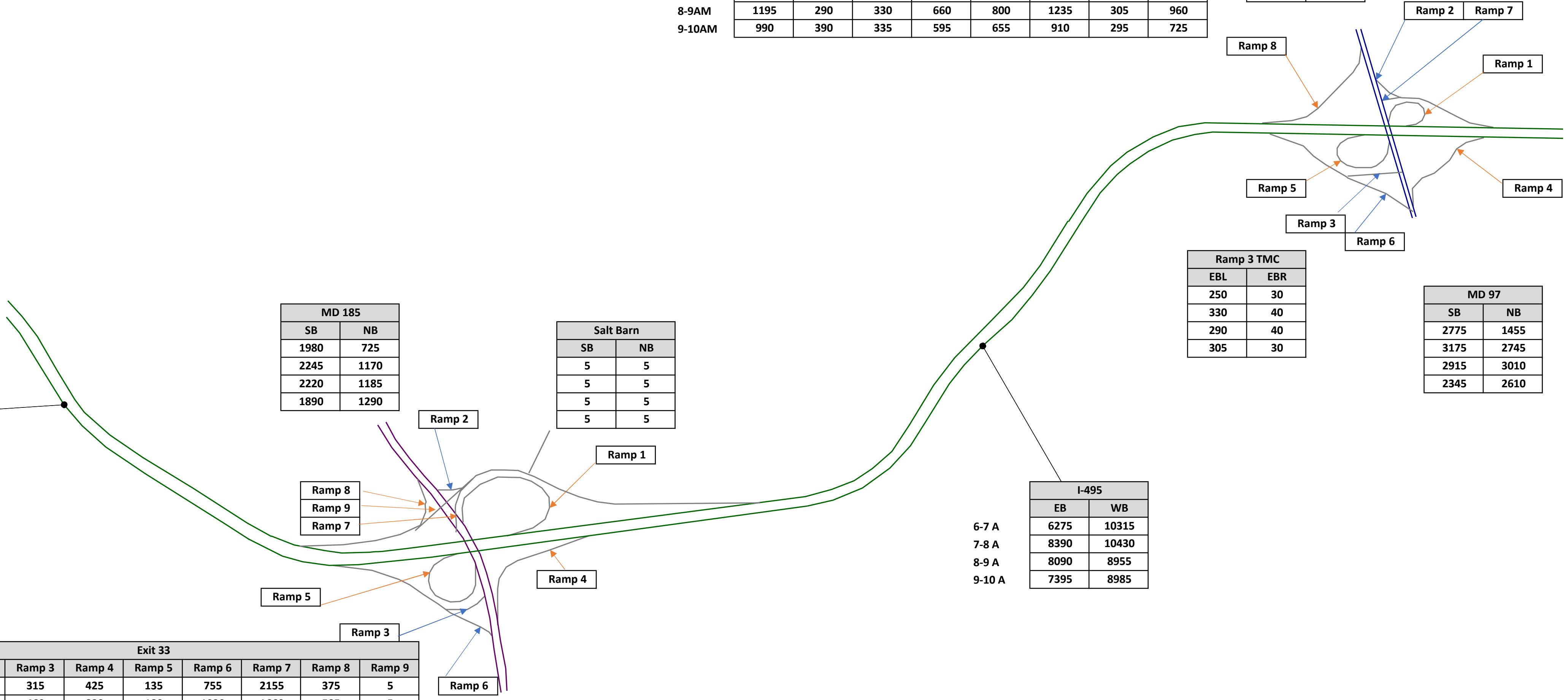
MD 355 (south)

	SB	NB
6-7A	3425	690
7-8A	3480	1965
8-9A	3765	2375
9-10A	3325	1960

I-495 North Side AM
Future Alternative No Build Peak Period Volumes

	Exit 31							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7AM	450	320	280	415	650	965	415	505
7-8AM	905	285	370	630	815	1170	290	775
8-9AM	1195	290	330	660	800	1235	305	960
9-10AM	990	390	335	595	655	910	295	725

MD 97	
SB	NB
2525	1155
3260	1825
3095	1735
2490	1725



Ramp 3 TMC	
EBL	EBR
250	30
330	40
290	40
305	30

MD 97	
SB	NB
2775	1455
3175	2745
2915	3010
2345	2610

MD 185	
SB	NB
1980	725
2245	1170
2220	1185
1890	1290

Salt Barn	
SB	NB
5	5
5	5
5	5
5	5

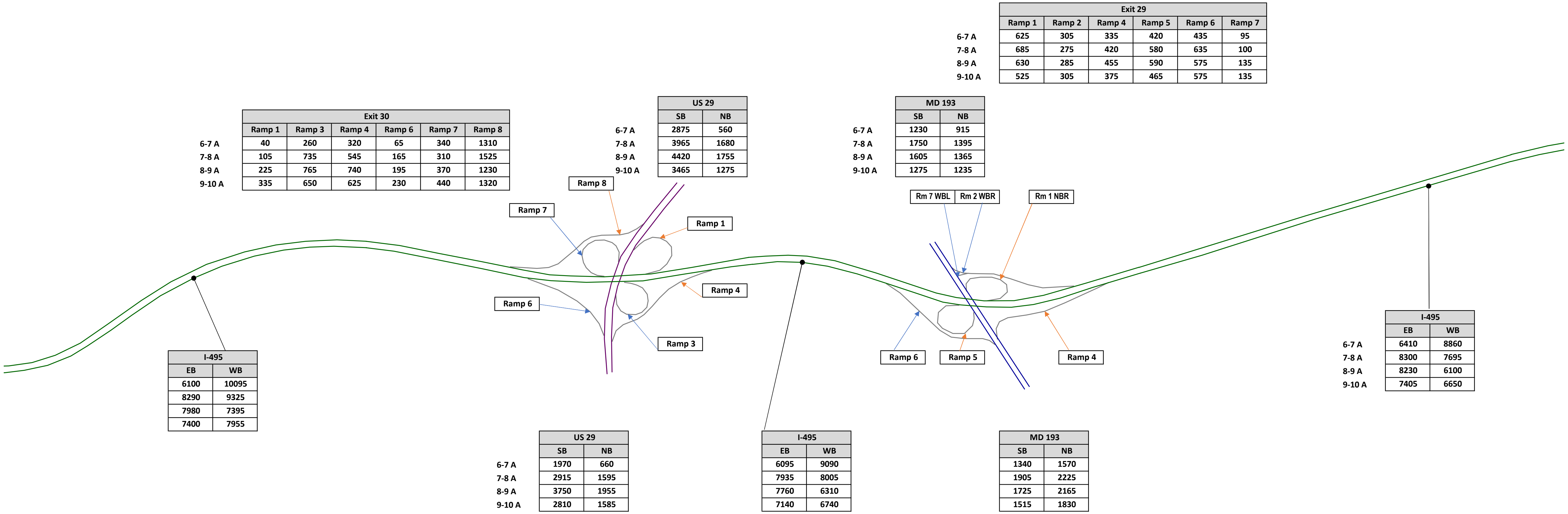
	I-495	
	EB	WB
6-7 A	6785	8360
7-8 A	8860	9570
8-9 A	8030	8995
9-10 A	7570	8520

	I-495	
	EB	WB
6-7 A	6275	10315
7-8 A	8390	10430
8-9 A	8090	8955
9-10 A	7395	8985

	Exit 33								
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9
6-7 A	225	400	315	425	135	755	2155	375	5
7-8 A	665	445	460	830	180	1020	1660	585	5
8-9 A	1105	260	365	900	235	710	1435	630	5
9-10 A	795	300	395	720	225	730	1445	485	5

MD 185	
SB	NB
4380	660
4160	1760
3500	2560
3350	2110

I-495 North Side AM
Future Alternative No Build Peak Period Volumes



	Exit 30					
	Ramp 1	Ramp 3	Ramp 4	Ramp 6	Ramp 7	Ramp 8
6-7 A	40	260	320	65	340	1310
7-8 A	105	735	545	165	310	1525
8-9 A	225	765	740	195	370	1230
9-10 A	335	650	625	230	440	1320

	US 29	
	SB	NB
6-7 A	2875	560
7-8 A	3965	1680
8-9 A	4420	1755
9-10 A	3465	1275

	Exit 29					
	Ramp 1	Ramp 2	Ramp 4	Ramp 5	Ramp 6	Ramp 7
6-7 A	625	305	335	420	435	95
7-8 A	685	275	420	580	635	100
8-9 A	630	285	455	590	575	135
9-10 A	525	305	375	465	575	135

	MD 193	
	SB	NB
6-7 A	1230	915
7-8 A	1750	1395
8-9 A	1605	1365
9-10 A	1275	1235

I-495	
EB	WB
6100	10095
8290	9325
7980	7395
7400	7955

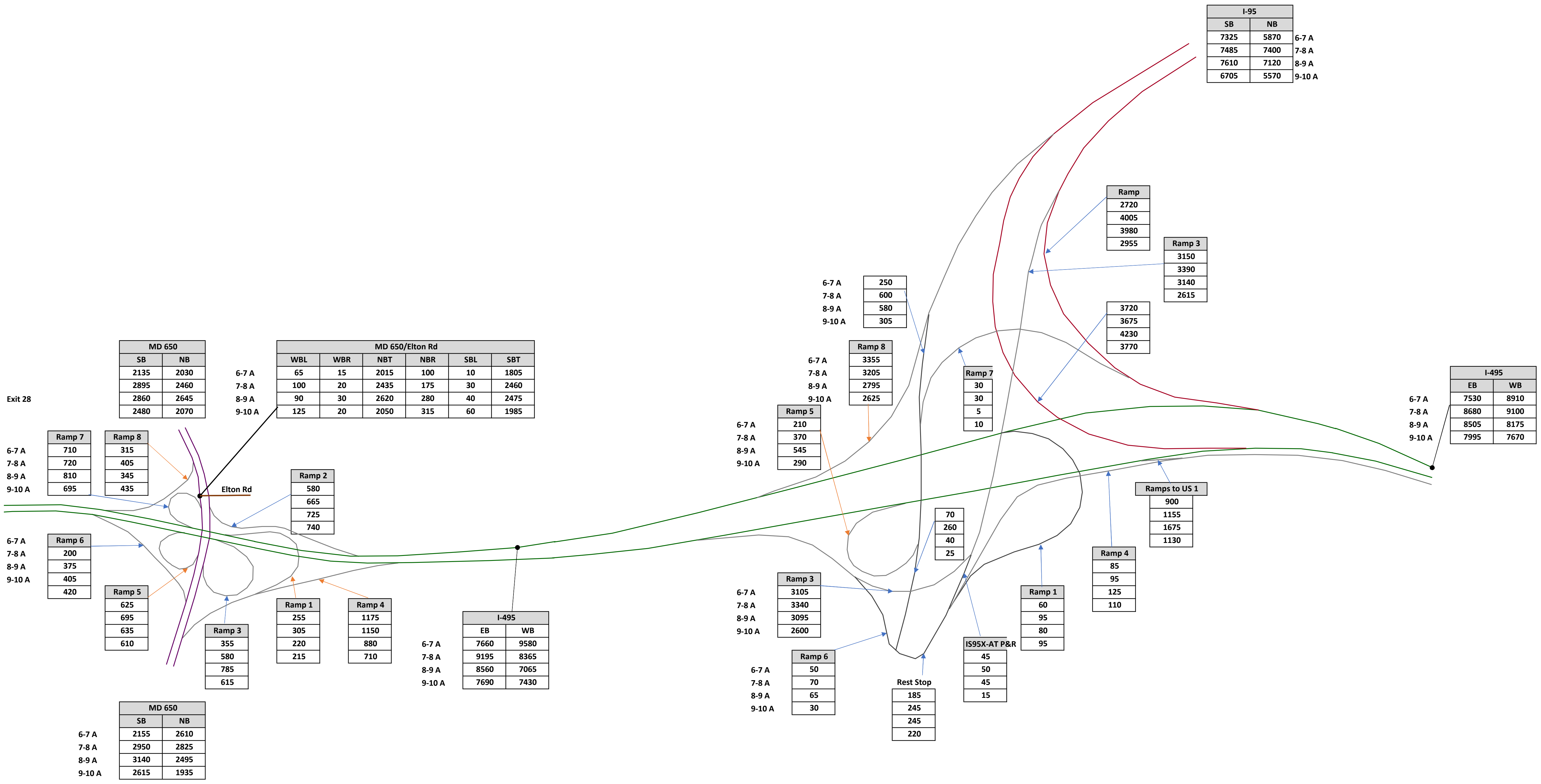
	I-495	
	EB	WB
6-7 A	6410	8860
7-8 A	8300	7695
8-9 A	8230	6100
9-10 A	7405	6650

	US 29	
	SB	NB
6-7 A	1970	660
7-8 A	2915	1595
8-9 A	3750	1955
9-10 A	2810	1585

I-495	
EB	WB
6095	9090
7935	8005
7760	6310
7140	6740

MD 193	
SB	NB
1340	1570
1905	2225
1725	2165
1515	1830

I-495 North Side AM
Future Alternative No Build Peak Period Volumes



	MD 650	
	SB	NB
	2135	2030
	2895	2460
	2860	2645
	2480	2070

	MD 650/Elton Rd					
	WBL	WBR	NBT	NBR	SBL	SBT
6-7 A	65	15	2015	100	10	1805
7-8 A	100	20	2435	175	30	2460
8-9 A	90	30	2620	280	40	2475
9-10 A	125	20	2050	315	60	1985

	Ramp 7	Ramp 8
6-7 A	710	315
7-8 A	720	405
8-9 A	810	345
9-10 A	695	435

Ramp 2
580
665
725
740

	Ramp 6
6-7 A	200
7-8 A	375
8-9 A	405
9-10 A	420

Ramp 5
625
695
635
610

Ramp 3
355
580
785
615

Ramp 1
255
305
220
215

Ramp 4
1175
1150
880
710

	I-495	
	EB	WB
6-7 A	7660	9580
7-8 A	9195	8365
8-9 A	8560	7065
9-10 A	7690	7430

	MD 650	
	SB	NB
6-7 A	2155	2610
7-8 A	2950	2825
8-9 A	3140	2495
9-10 A	2615	1935

	I-95		
	SB	NB	
	7325	5870	6-7 A
	7485	7400	7-8 A
	7610	7120	8-9 A
	6705	5570	9-10 A

Ramp
2720
4005
3980
2955

Ramp 3
3150
3390
3140
2615

6-7 A	250
7-8 A	600
8-9 A	580
9-10 A	305

3720
3675
4230
3770

	Ramp 8
6-7 A	3355
7-8 A	3205
8-9 A	2795
9-10 A	2625

Ramp 7
30
30
5
10

	Ramp 5
6-7 A	210
7-8 A	370
8-9 A	545
9-10 A	290

	I-495	
	EB	WB
6-7 A	7530	8910
7-8 A	8680	9100
8-9 A	8505	8175
9-10 A	7995	7670

Ramps to US 1
900
1155
1675
1130

70
260
40
25

Ramp 4
85
95
125
110

	Ramp 3
6-7 A	3105
7-8 A	3340
8-9 A	3095
9-10 A	2600

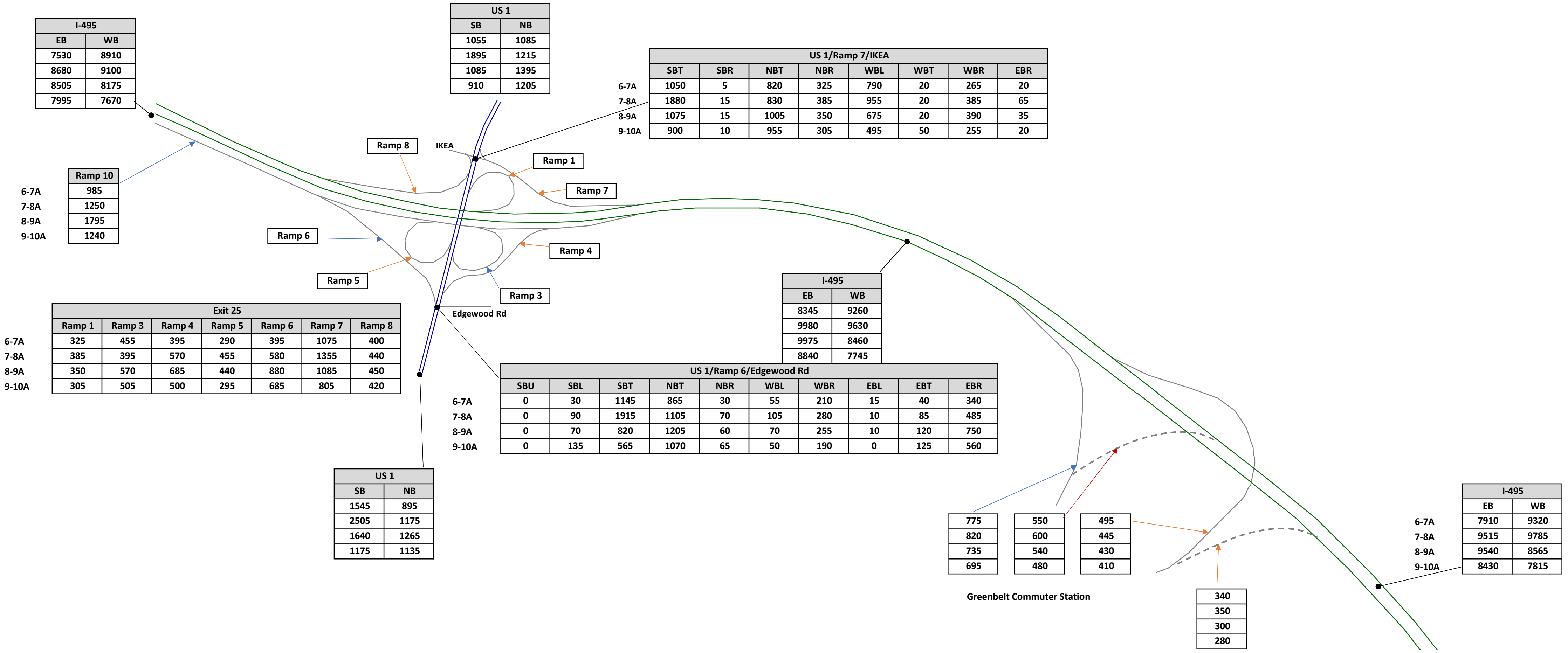
Ramp 1
60
95
80
95

	Ramp 6
6-7 A	50
7-8 A	70
8-9 A	65
9-10 A	30

Rest Stop
185
245
245
220

IS95X-AT P&R
45
50
45
15

I-495 North East Side AM
Future Alternative No Build Peak Period Volumes



I-495	
EB	WB
7530	8910
8680	9100
8505	8175
7995	7670

US 1	
SB	NB
1055	1085
1895	1215
1085	1395
910	1205

	US 1/Ramp 7/IKEA							
	SBT	SBR	NBT	NBR	WBL	WBT	WBR	EBR
6-7A	1050	5	820	325	790	20	265	20
7-8A	1880	15	830	385	955	20	385	65
8-9A	1075	15	1005	350	675	20	390	35
9-10A	900	10	955	305	495	50	255	20

	Ramp 10
6-7A	985
7-8A	1250
8-9A	1795
9-10A	1240

	I-495	
	EB	WB
	8345	9260
	9980	9630
	9975	8460
	8840	7745

	Exit 25						
	Ramp 1	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	325	455	395	290	395	1075	400
7-8A	385	395	570	455	580	1355	440
8-9A	350	570	685	440	880	1085	450
9-10A	305	505	500	295	685	805	420

	US 1/Ramp 6/Edgewood Rd									
	SBU	SBL	SBT	NBT	NBR	WBL	WBR	EBL	EBT	EBR
6-7A	0	30	1145	865	30	55	210	15	40	340
7-8A	0	90	1915	1105	70	105	280	10	85	485
8-9A	0	70	820	1205	60	70	255	10	120	750
9-10A	0	135	565	1070	65	50	190	0	125	560

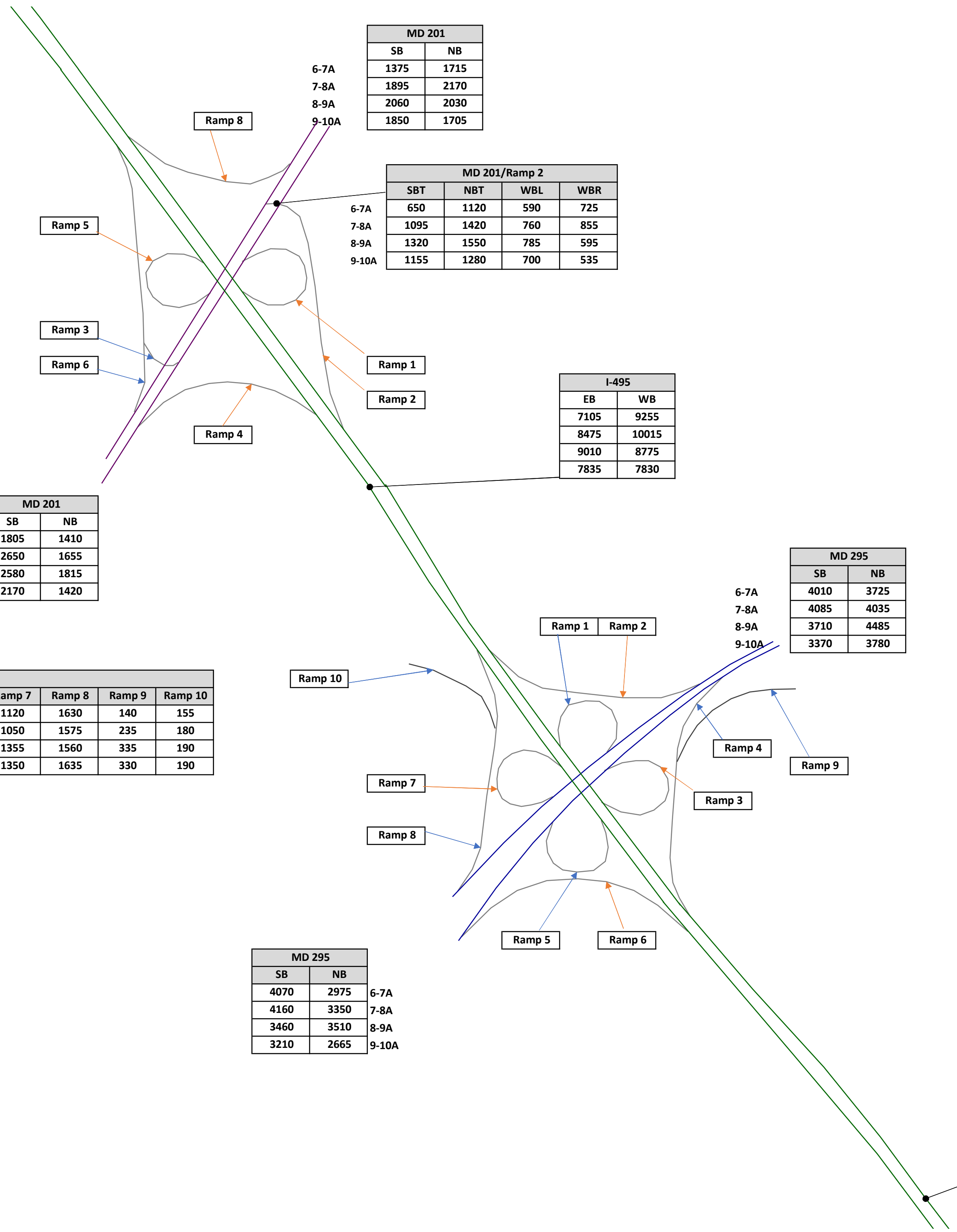
US 1	
SB	NB
1545	895
2505	1175
1640	1265
1175	1135

775	550	495
820	600	445
735	540	430
695	480	410

340
350
300
280

	I-495	
	EB	WB
6-7A	7910	9320
7-8A	9515	9785
8-9A	9540	8565
9-10A	8430	7815

I-495 North East Side AM
Future Alternative No Build Peak Period Volumes



	MD 201	
	SB	NB
6-7A	1375	1715
7-8A	1895	2170
8-9A	2060	2030
9-10A	1850	1705

	MD 201/Ramp 2			
	SBT	NBT	WBL	WBR
6-7A	650	1120	590	725
7-8A	1095	1420	760	855
8-9A	1320	1550	785	595
9-10A	1155	1280	700	535

	Exit 23						
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8
6-7A	680	1315	590	330	410	950	700
7-8A	620	1620	655	380	490	1255	770
8-9A	455	1380	625	550	700	1155	715
9-10A	545	1235	760	460	655	950	675

I-495	
EB	WB
7105	9255
8475	10015
9010	8775
7835	7830

MD 201	
SB	NB
1805	1410
2650	1655
2580	1815
2170	1420

	MD 193	
	EB	WB
6-7A	565	1025
7-8A	1030	2615
8-9A	1615	2450
9-10A	1365	1965

	MD 295	
	SB	NB
6-7A	4010	3725
7-8A	4085	4035
8-9A	3710	4485
9-10A	3370	3780

MD 295 N of MD 193	
SB	NB
3480	3715
3665	3695
3350	4260
2975	3655

MD 193

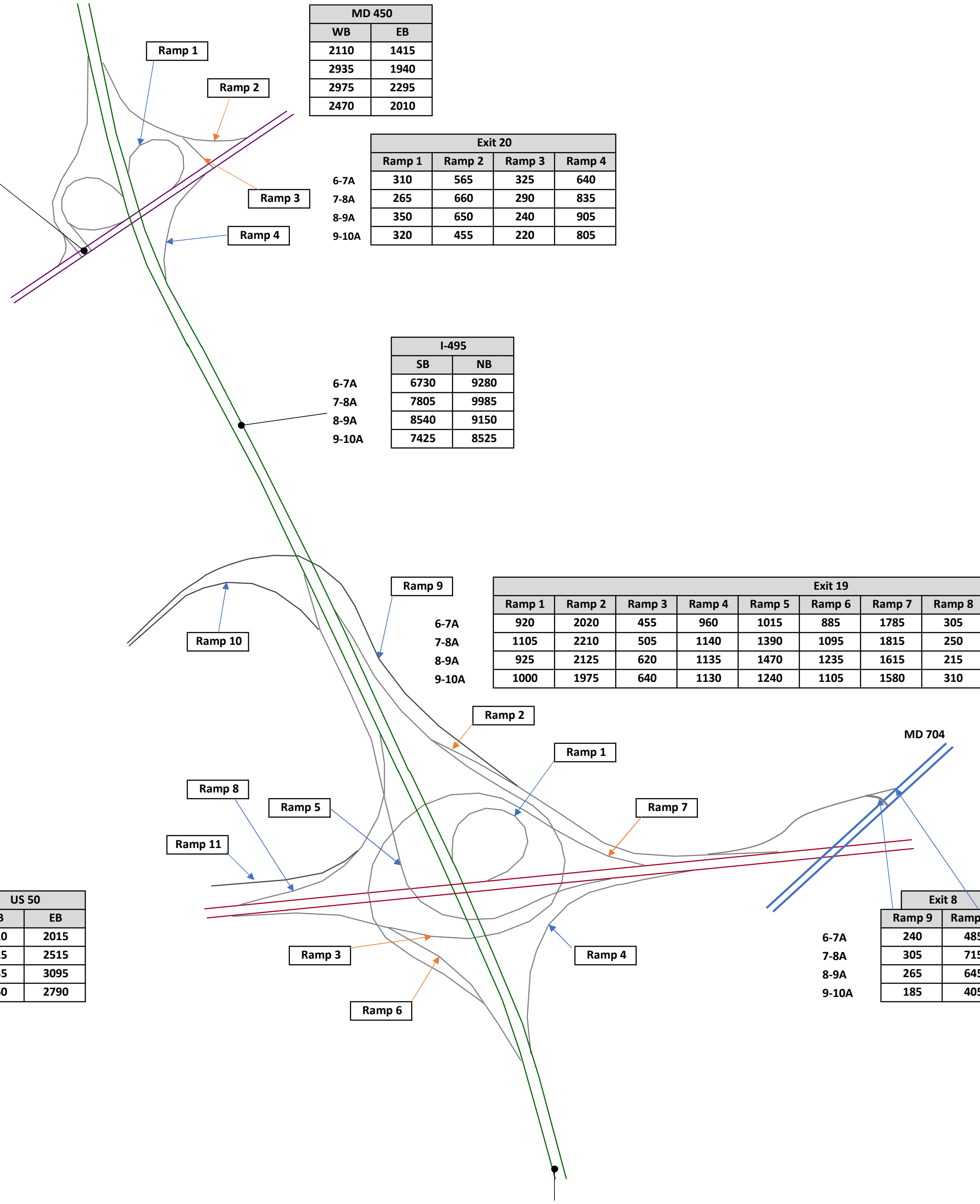
6-7A
7-8A
8-9A
9-10A

	Exit 22									
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
6-7A	25	475	1340	1610	500	25	1120	1630	140	155
7-8A	50	500	1395	1425	685	35	1050	1575	235	180
8-9A	55	510	1255	1380	875	30	1355	1560	335	190
9-10A	45	495	1065	1430	790	35	1350	1635	330	190

MD 295		
SB	NB	
4070	2975	6-7A
4160	3350	7-8A
3460	3510	8-9A
3210	2665	9-10A

	I-495	
	SB	NB
6-7A	6275	9215
7-8A	7475	9835
8-9A	8150	8785
9-10A	6985	8075

I-495 North East Side AM
Future Alternative No Build Peak Period Volumes



MD 450	
WB	EB
2110	1415
2935	1940
2975	2295
2470	2010

Exit 20	Ramp 8	Ramp 5	Ramp 6	Ramp 7
6-7A	315	295	355	710
7-8A	485	360	380	795
8-9A	480	390	420	845
9-10A	305	345	350	735

	Exit 20			
	Ramp 1	Ramp 2	Ramp 3	Ramp 4
6-7A	310	565	325	640
7-8A	265	660	290	835
8-9A	350	650	240	905
9-10A	320	455	220	805

MD 450	
WB	EB
1460	1160
2225	1405
2315	1660
1910	1435

	I-495	
	SB	NB
6-7A	6730	9280
7-8A	7805	9985
8-9A	8540	9150
9-10A	7425	8525

	Exit 19										
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10	Ramp 11
6-7A	920	2020	455	960	1015	885	1785	305	570	10	370
7-8A	1105	2210	505	1140	1390	1095	1815	250	880	10	450
8-9A	925	2125	620	1135	1470	1235	1615	215	640	40	450
9-10A	1000	1975	640	1130	1240	1105	1580	310	345	20	325

US-50	
WB	EB
7230	2655
7750	3445
7270	3845
6155	3420

	US 50	
	WB	EB
6-7A	4810	2015
7-8A	5225	2515
8-9A	4935	3095
9-10A	4160	2790

	Exit 8	
	Ramp 9	Ramp 10
6-7A	240	485
7-8A	305	715
8-9A	265	645
9-10A	185	405

I-495	
SB	NB
7710	8685
8635	9515
9295	8465
8255	8050

I-495 East Side AM
Future Alternative No Build Peak Period Volumes

	Exit 17			
	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	325	405	150	305
7-8A	700	535	245	425
8-9A	930	695	325	465
9-10A	735	625	265	405

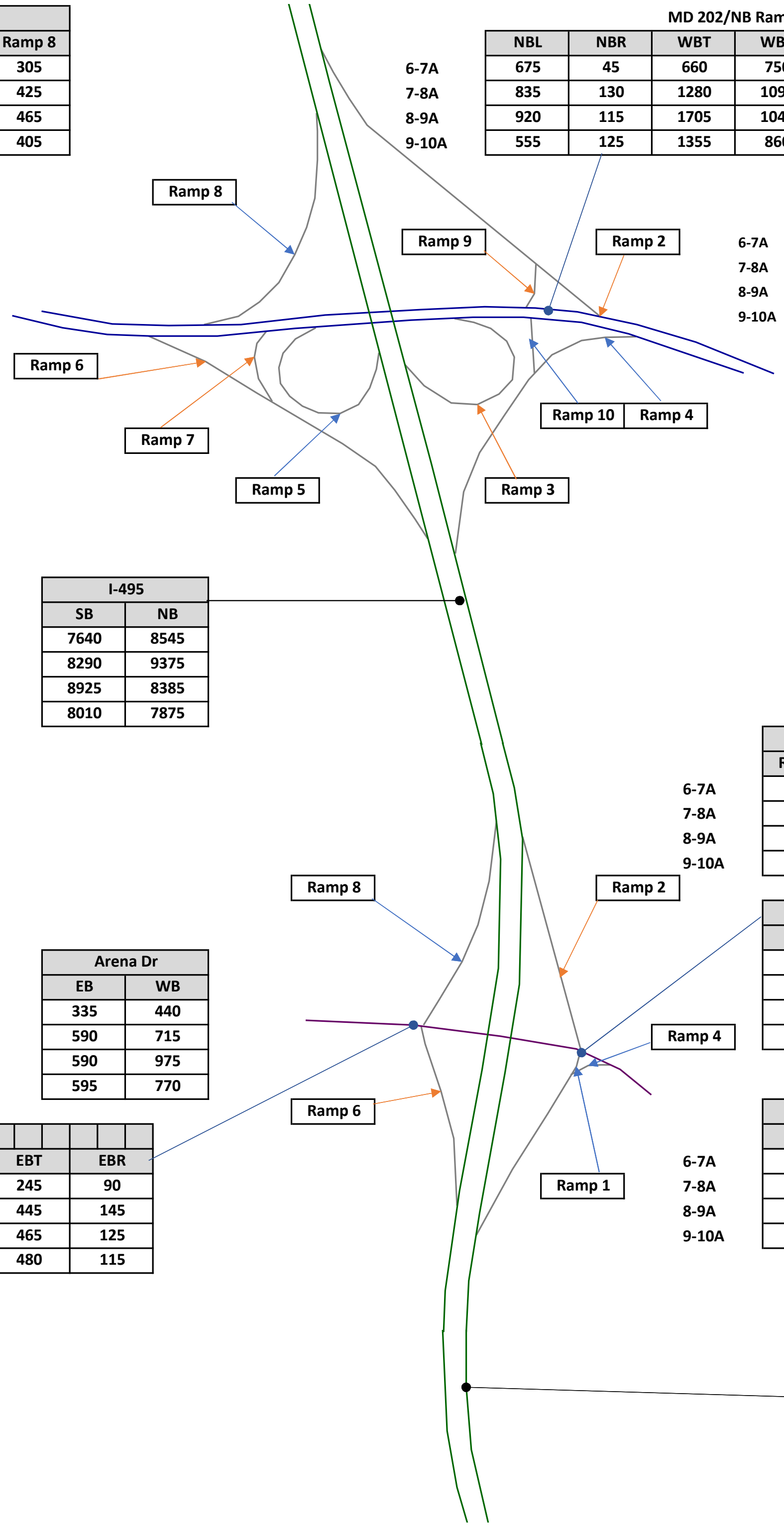
MD 202/NB Ramps

	NBL	NBR	WBT	WBR	EBL	EBT
6-7A	675	45	660	750	10	695
7-8A	835	130	1280	1090	15	1410
8-9A	920	115	1705	1040	5	1550
9-10A	555	125	1355	860	15	1355

Ramp 10 TMC	
NBR	NBL
45	675
130	835
115	920
125	555

	MD 202	
	EB	WB
6-7A	930	1485
7-8A	1405	2300
8-9A	1510	2765
9-10A	1375	2045

	Exit 17				
	Ramp 2	Ramp 3	Ramp 4	Ramp 9	Ramp 10
6-7A	750	150	45	10	720
7-8A	1090	145	135	15	970
8-9A	1040	190	120	5	1040
9-10A	860	115	130	15	685



MD 202	
SB	NB
785	1410
1675	2370
1785	2745
1610	2215

I-495	
SB	NB
7640	8545
8290	9375
8925	8385
8010	7875

	Exit 16				
	Ramp 1	Ramp 2	Ramp 4	Ramp 6	Ramp 8
6-7A	135	310	310	190	255
7-8A	165	425	380	295	340
8-9A	215	380	400	265	560
9-10A	160	365	220	265	450

MD 214/NB Ramps						
NBL	NBT	NBR	WBT	WBR	EBL	EBT
135	0	310	245	155	155	185
165	0	380	480	220	205	360
215	0	400	540	205	175	495
160	0	220	495	175	195	475

Arena Dr	
EB	WB
335	440
590	715
590	975
595	770

	MD 214/SB Ramps						
	SBL	SBT	SBR	WBL	WBT	EBT	EBR
6-7A	95	0	160	100	280	245	90
7-8A	120	0	220	150	500	445	145
8-9A	205	0	355	140	620	465	125
9-10A	185	0	260	150	505	480	115

	Arena Dr	
	EB	WB
6-7A	495	400
7-8A	735	700
8-9A	890	745
9-10A	695	670

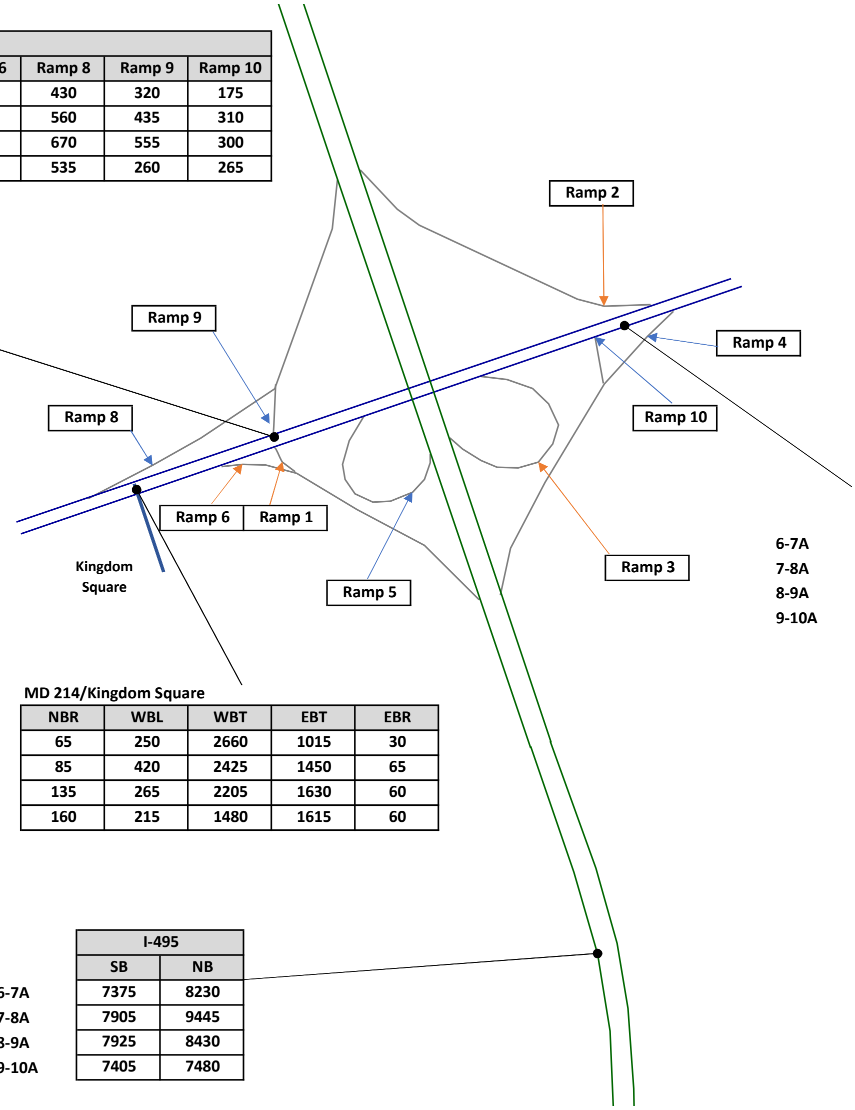
I-495	
SB	NB
7570	8675
8245	9490
8630	8620
7825	7885

I-495 East Side AM
Future Alternative No Build Peak Period Volumes

	Exit 15								
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8	Ramp 9	Ramp 10
6-7A	805	535	655	570	525	275	430	320	175
7-8A	1020	595	810	1050	680	315	560	435	310
8-9A	925	525	825	855	770	370	670	555	300
9-10A	730	515	805	650	760	405	535	260	265

	MD 214/SB Ramps				
	SBR	WBL	WBT	EBT	EBR
6-7A	320	805	2160	805	275
7-8A	435	1020	1850	1215	315
8-9A	555	925	1250	1400	370
9-10A	260	730	900	1370	405

	MD 214	
	EB	WB
6-7A	1045	2660
7-8A	1515	2425
8-9A	1695	2205
9-10A	1680	1480



MD 214		
EB	WB	
1240	3325	6-7A
2140	3155	7-8A
2205	2395	8-9A
1975	1880	9-10A

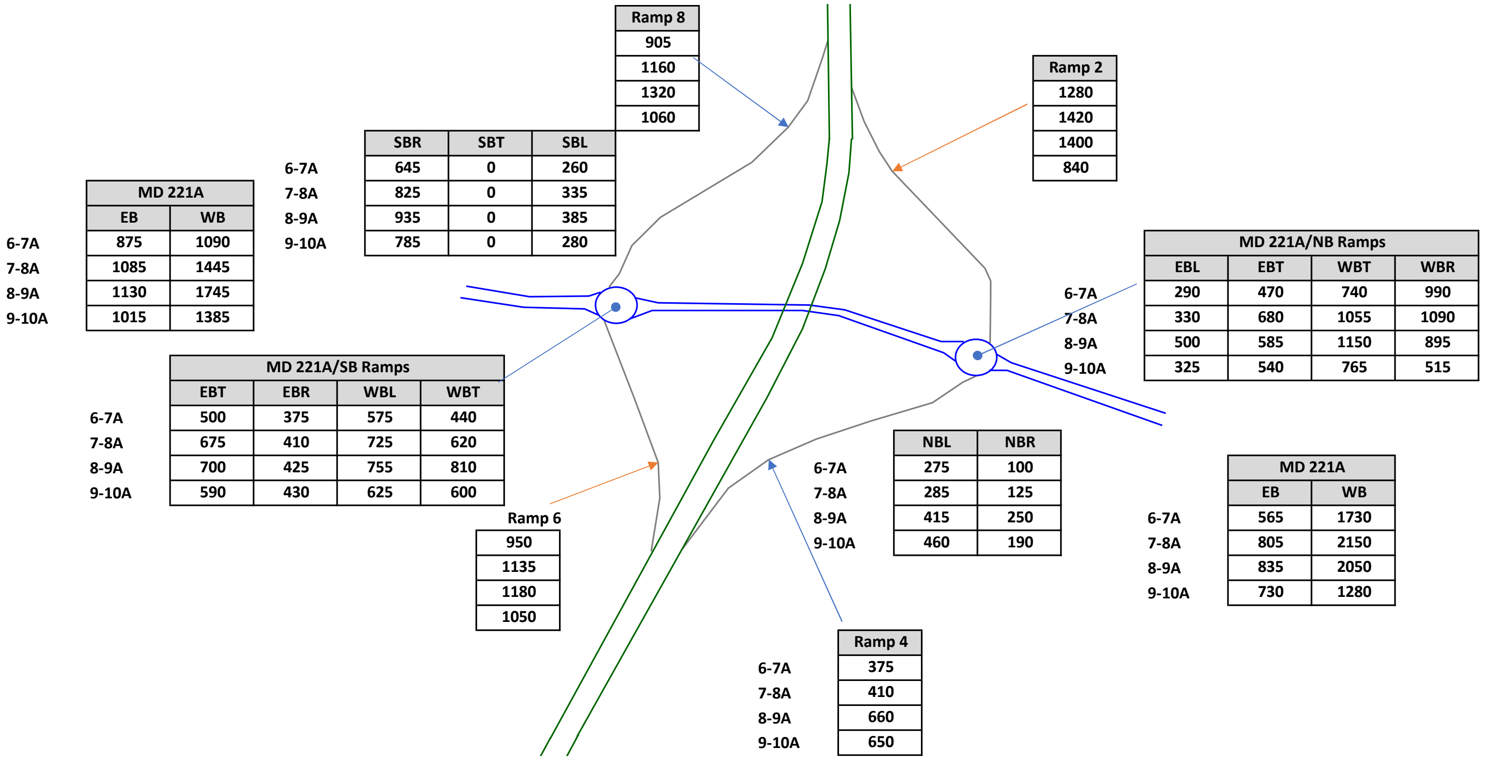
	MD 214/NB Ramps				
	NBL	NBR	WBT	WBR	EBT
6-7A	175	570	2790	535	675
7-8A	310	1050	2560	595	1090
8-9A	300	855	1870	525	1345
9-10A	265	650	1360	515	1325

MD 214/Kingdom Square

	NBR	WBL	WBT	EBT	EBR
6-7A	65	250	2660	1015	30
7-8A	85	420	2425	1450	65
8-9A	135	265	2205	1630	60
9-10A	160	215	1480	1615	60

	I-495	
	SB	NB
6-7A	7375	8230
7-8A	7905	9445
8-9A	7925	8430
9-10A	7405	7480

I-495 East Side AM
Future Alternative No Build Peak Period Volumes



Ramp 8
905
1160
1320
1060

	SBR	SBT	SBL
6-7A	645	0	260
7-8A	825	0	335
8-9A	935	0	385
9-10A	785	0	280

Ramp 2
1280
1420
1400
840

	MD 221A	
	EB	WB
6-7A	875	1090
7-8A	1085	1445
8-9A	1130	1745
9-10A	1015	1385

	MD 221A/NB Ramps			
	EBL	EBT	WBT	WBR
6-7A	290	470	740	990
7-8A	330	680	1055	1090
8-9A	500	585	1150	895
9-10A	325	540	765	515

	MD 221A/SB Ramps			
	EBT	EBR	WBL	WBT
6-7A	500	375	575	440
7-8A	675	410	725	620
8-9A	700	425	755	810
9-10A	590	430	625	600

	NBL	NBR
6-7A	275	100
7-8A	285	125
8-9A	415	250
9-10A	460	190

	MD 221A	
	EB	WB
6-7A	565	1730
7-8A	805	2150
8-9A	835	2050
9-10A	730	1280

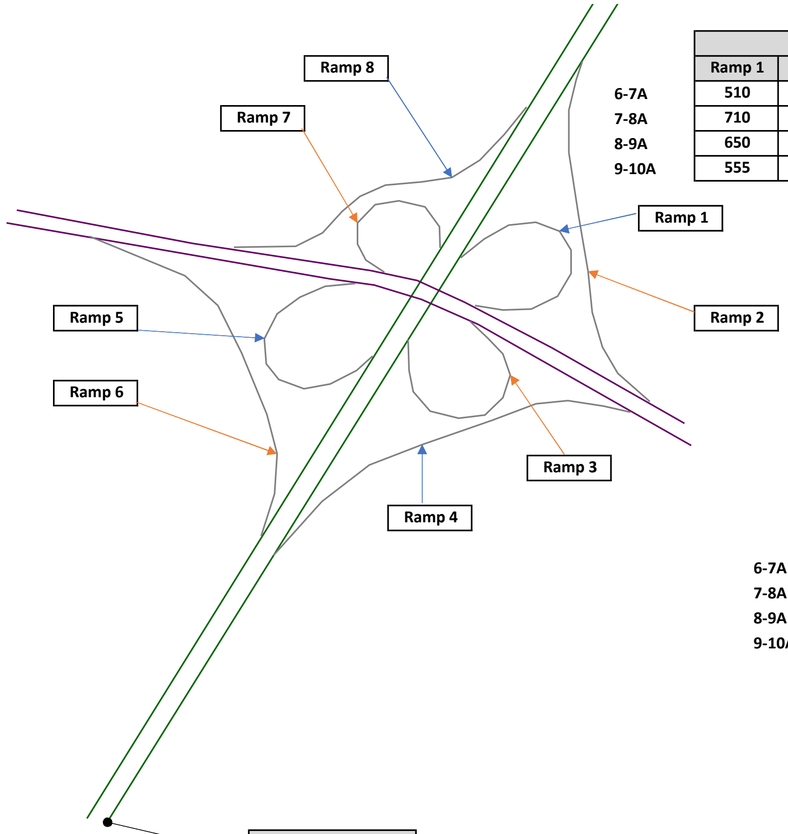
Ramp 6
950
1135
1180
1050

	Ramp 4
6-7A	375
7-8A	410
8-9A	660
9-10A	650

I-495 East Side AM
Future Alternative No Build Peak Period Volumes

	Exit 11							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	510	1995	420	605	760	475	1395	1010
7-8A	710	2000	495	545	665	440	1075	1265
8-9A	650	2060	495	595	515	470	1005	765
9-10A	555	1910	460	545	585	380	830	810

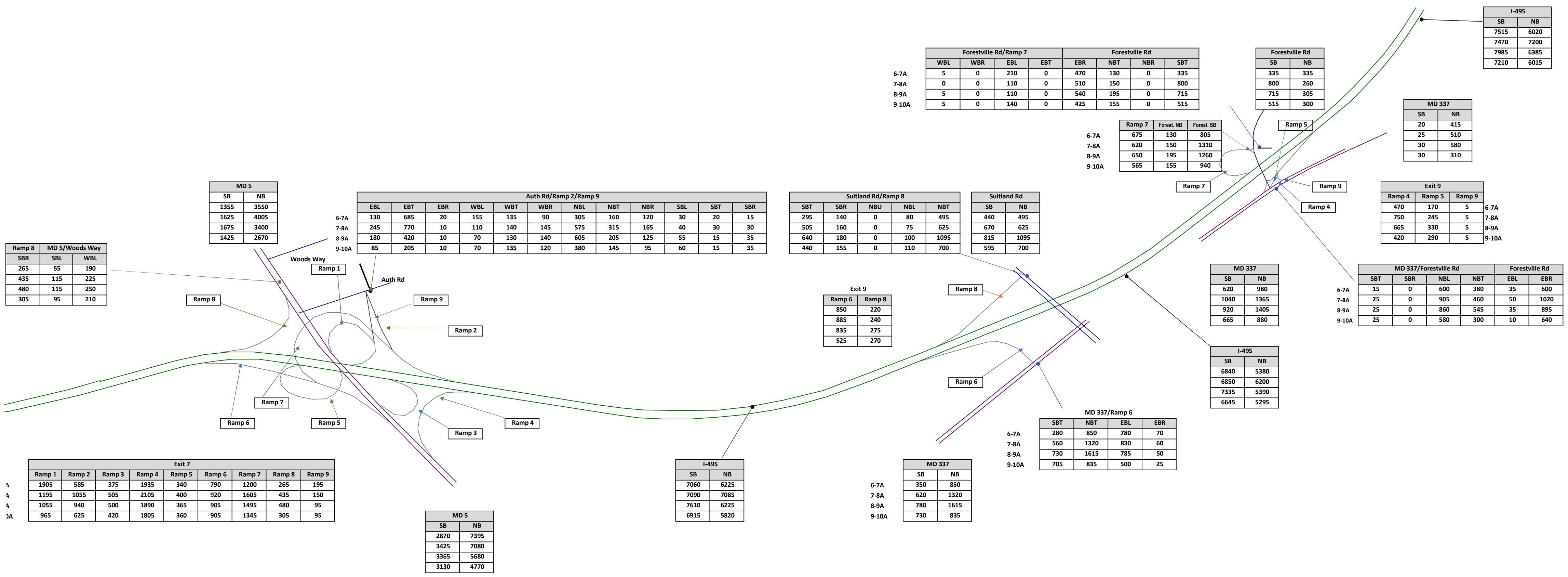
	MD 4	
	SB	NB
6-7A	1245	2000
7-8A	1560	3100
8-9A	1485	2180
9-10A	1380	1600



	MD 4	
	SB	NB
6-7A	1715	3860
7-8A	1835	4205
8-9A	1635	3825
9-10A	1665	2980

	I-495	
	SB	NB
6-7A	7515	6020
7-8A	7470	7200
8-9A	7985	6385
9-10A	7210	6015

I-495 South Side AM
Future Alternative No Build Peak Period Volumes



Forestville Rd/Ramp 7					Forestville Rd			
	WBL	WBR	EBL	EBT	EBR	NBT	NBR	SBT
6-7A	5	0	210	0	470	130	0	335
7-8A	0	0	110	0	510	150	0	800
8-9A	5	0	110	0	540	195	0	715
9-10A	5	0	140	0	425	155	0	515

Forestville Rd	
SB	NB
335	335
800	260
715	305
515	300

I-495	
SB	NB
7515	6020
7470	7200
7985	6385
7210	6015

	Ramp 7	Forest. NB	Forest. SB
6-7A	675	130	805
7-8A	620	150	1310
8-9A	650	195	1260
9-10A	565	155	940

MD 337	
SB	NB
20	415
25	510
30	580
30	310

Exit 9			
Ramp 4	Ramp 5	Ramp 9	
470	170	5	6-7A
750	245	5	7-8A
665	330	5	8-9A
420	290	5	9-10A

MD 5	
SB	NB
1355	3550
1625	4005
1675	3400
1425	2670

	Auth Rd/Ramp 2/Ramp 9											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
6-7A	130	685	20	155	135	90	305	160	120	30	20	15
7-8A	245	770	10	110	140	145	575	315	165	40	30	30
8-9A	180	420	10	70	130	140	605	205	125	55	15	35
9-10A	85	205	10	70	135	120	380	145	95	60	15	35

Suitland Rd/Ramp 8				
SBT	SBR	NBU	NBL	NBT
295	140	0	80	495
505	160	0	75	625
640	180	0	100	1095
440	155	0	110	700

Suitland Rd	
SB	NB
440	495
670	625
815	1095
595	700

Ramp 8	MD 5/Woods Way	
SBR	SBL	WBL
265	55	190
435	115	225
480	115	250
305	95	210

Exit 9

Ramp 6	Ramp 8
850	220
885	240
835	275
525	270

MD 337	
SB	NB
620	980
1040	1365
920	1405
665	880

	MD 337/Forestville Rd				Forestville Rd	
	SBT	SBR	NBL	NBT	EBL	EBR
6-7A	15	0	600	380	35	600
7-8A	25	0	905	460	50	1020
8-9A	25	0	860	545	35	895
9-10A	25	0	580	300	10	640

I-495	
SB	NB
6840	5380
6850	6200
7335	5390
6645	5295

MD 337/Ramp 6

	SBT	NBT	EBL	EBR
6-7A	280	850	780	70
7-8A	560	1320	830	60
8-9A	730	1615	785	50
9-10A	705	835	500	25

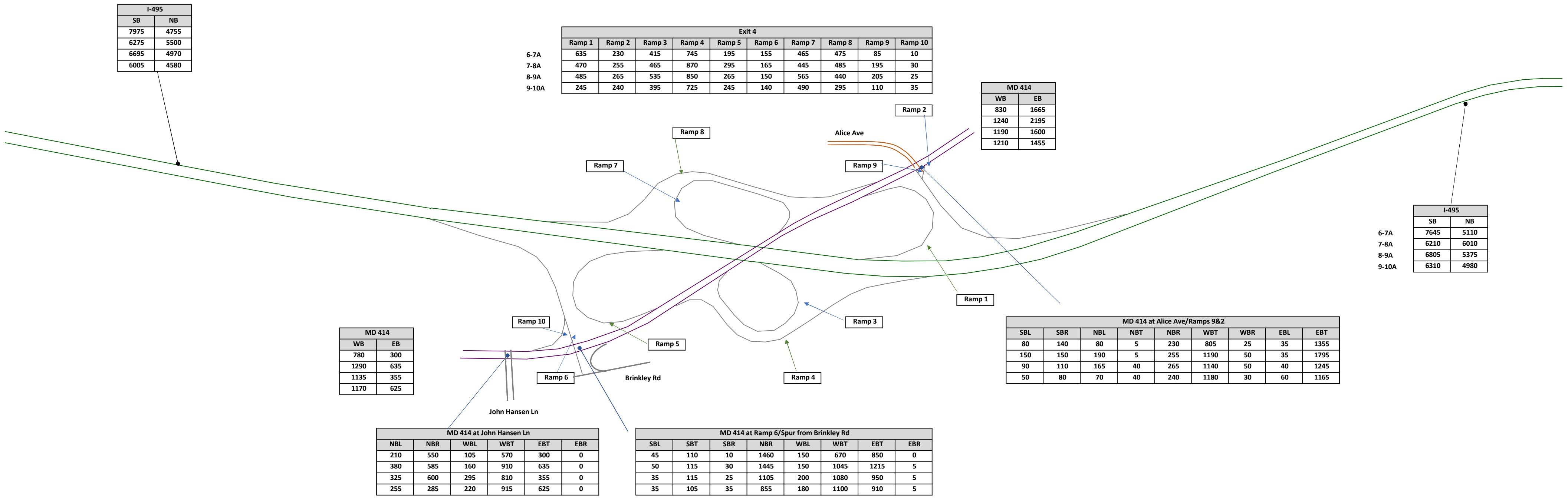
	Exit 7								
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9
A	1905	585	375	1935	340	790	1200	265	195
A	1195	1055	505	2105	400	920	1605	435	150
A	1055	940	500	1890	365	905	1495	480	95
0A	965	625	420	1805	360	905	1345	305	95

MD 5	
SB	NB
2870	7395
3425	7080
3365	5680
3130	4770

I-495	
SB	NB
7060	6225
7090	7085
7610	6225
6915	5820

	MD 337	
	SB	NB
6-7A	350	850
7-8A	620	1320
8-9A	780	1615
9-10A	730	835

I-495 South Side AM
Future Alternative No Build Peak Period Volumes



I-495	
SB	NB
7975	4755
6275	5500
6695	4970
6005	4580

	Exit 4									
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
6-7A	635	230	415	745	195	155	465	475	85	10
7-8A	470	255	465	870	295	165	445	485	195	30
8-9A	485	265	535	850	265	150	565	440	205	25
9-10A	245	240	395	725	245	140	490	295	110	35

MD 414	
WB	EB
830	1665
1240	2195
1190	1600
1210	1455

	I-495	
	SB	NB
6-7A	7645	5110
7-8A	6210	6010
8-9A	6805	5375
9-10A	6310	4980

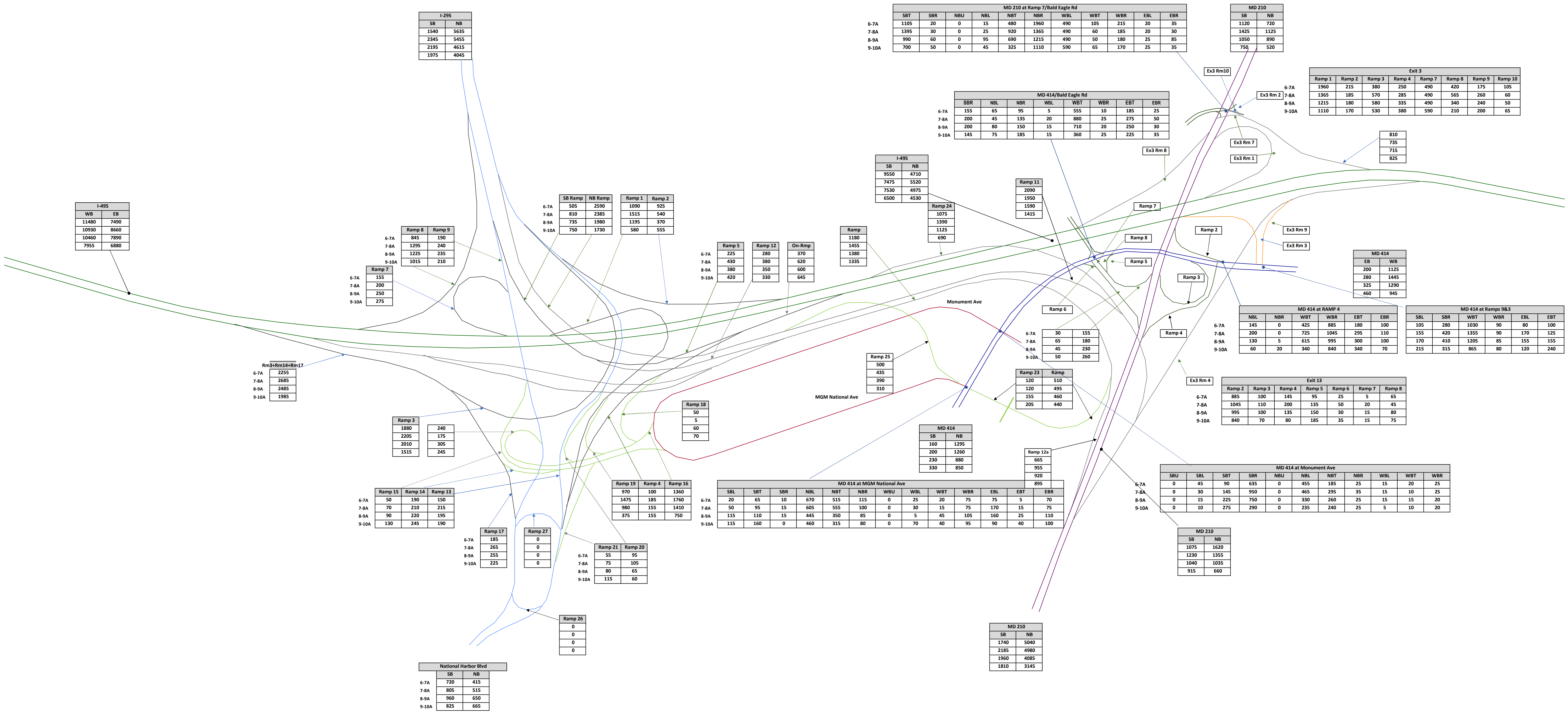
MD 414 at Alice Ave/Ramps 9&2								
SBL	SBR	NBL	NBT	NBR	WBT	WBR	EBL	EBT
80	140	80	5	230	805	25	35	1355
150	150	190	5	255	1190	50	35	1795
90	110	165	40	265	1140	50	40	1245
50	80	70	40	240	1180	30	60	1165

MD 414	
WB	EB
780	300
1290	635
1135	355
1170	625

MD 414 at John Hansen Ln					
NBL	NBR	WBL	WBT	EBT	EBR
210	550	105	570	300	0
380	585	160	910	635	0
325	600	295	810	355	0
255	285	220	915	625	0

MD 414 at Ramp 6/Spur from Brinkley Rd							
SBL	SBT	SBR	NBR	WBL	WBT	EBT	EBR
45	110	10	1460	150	670	850	0
50	115	30	1445	150	1045	1215	5
35	115	25	1105	200	1080	950	5
35	105	35	855	180	1100	910	5

I-495 South Side AM
Future Alternative No Build Peak Period Volumes



I-295	
SB	NB
1540	5635
2345	5455
2195	4615
1975	4045

	MD 210 at Ramp 7/Bald Eagle Rd										
	SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBR
6-7A	1105	20	0	15	480	1960	490	105	215	20	35
7-8A	1395	30	0	25	920	1365	490	60	185	20	30
8-9A	990	60	0	95	690	1215	490	50	180	25	85
9-10A	700	50	0	45	325	1110	590	65	170	25	35

MD 210	
SB	NB
1120	720
1425	1125
1050	890
750	520

	Exit 3							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 7	Ramp 8	Ramp 9	Ramp 10
6-7A	1960	215	380	250	490	420	175	105
7-8A	1365	185	570	285	490	565	260	60
8-9A	1215	180	580	335	490	340	240	50
9-10A	1110	170	530	380	590	210	200	65

	MD 414/Bald Eagle Rd							
	SBR	NBL	NBR	WBL	WBT	WBR	EBT	EBR
6-7A	155	65	95	5	555	10	185	25
7-8A	200	45	135	20	880	25	275	50
8-9A	200	80	150	15	710	20	250	30
9-10A	145	75	185	15	360	25	225	35

810
735
715
825

I-495	
SB	NB
9550	4710
7475	5520
7530	4975
6500	4530

Ramp 24
1075
1390
1125
690

Ramp 11
2090
1950
1590
1415

I-495	
WB	EB
11480	7490
10930	8660
10460	7890
7955	6880

	Ramp 8	Ramp 9
6-7A	845	190
7-8A	1295	240
8-9A	1225	235
9-10A	1015	210

	Ramp 7
6-7A	155
7-8A	200
8-9A	250
9-10A	275

	SB Ramp	NB Ramp
6-7A	505	2590
7-8A	810	2385
8-9A	735	1980
9-10A	750	1730

Ramp 1	Ramp 2
1090	925
1515	540
1195	370
580	555

	Ramp 5	Ramp 12	On-Rmp
6-7A	225	280	370
7-8A	430	380	620
8-9A	380	350	600
9-10A	420	330	645

Ramp
1180
1455
1380
1335

MD 414	
EB	WB
200	1125
280	1445
325	1290
460	945

	MD 414 at RAMP 4					
	NBL	NBR	WBT	WBR	EBT	EBR
6-7A	145	0	425	885	180	100
7-8A	200	0	725	1045	295	110
8-9A	130	5	615	995	300	100
9-10A	60	20	340	840	340	70

MD 414 at Ramps 9&3					
SBL	SBR	WBT	WBR	EBL	EBT
105	280	1030	90	80	100
155	420	1355	90	170	125
170	410	1205	85	155	155
215	315	865	80	120	240

6-7A	30	155
7-8A	65	180
8-9A	45	230
9-10A	50	260

Ramp 25
500
435
390
310

Ramp 23	Ramp
120	510
120	495
155	460
205	440

	Exit 13						
	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	885	100	145	95	25	5	65
7-8A	1045	110	200	135	50	20	45
8-9A	995	100	135	150	30	15	80
9-10A	840	70	80	185	35	15	75

	Rm3+Rm14+Rm17
6-7A	2255
7-8A	2685
8-9A	2485
9-10A	1985

Ramp 3
1880
2205
2010
1515

240
175
305
245

Ramp 18
50
5
60
70

MD 414	
SB	NB
160	1295
200	1260
230	880
330	850

Ramp 12a
665
955
920
895

	MD 414 at Monument Ave										
	SBU	SBL	SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR
6-7A	0	45	90	635	0	455	185	25	15	20	25
7-8A	0	30	145	950	0	465	295	35	15	10	25
8-9A	0	15	225	750	0	330	260	25	15	15	20
9-10A	0	10	275	290	0	235	240	25	5	10	20

	Ramp 15	Ramp 14	Ramp 13
6-7A	50	190	150
7-8A	70	210	215
8-9A	90	220	195
9-10A	130	245	190

Ramp 19	Ramp 4	Ramp 16
970	100	1360
1475	185	1760
980	155	1410
375	155	750

	MD 414 at MGM National Ave											
	SBL	SBT	SBR	NBL	NBT	NBR	WBU	WBL	WBT	WBR	EBL	EBT	EBR
6-7A	20	65	10	670	515	115	0	25	20	75	75	5	70
7-8A	50	95	15	605	555	100	0	30	15	75	170	15	75
8-9A	115	110	15	445	350	85	0	5	45	105	160	25	110
9-10A	115	160	0	460	315	80	0	70	40	95	90	40	100

MD 210	
SB	NB
1075	1620
1230	1355
1040	1035
915	660

	Ramp 17
6-7A	185
7-8A	265
8-9A	255
9-10A	225

Ramp 27
0
0
0
0

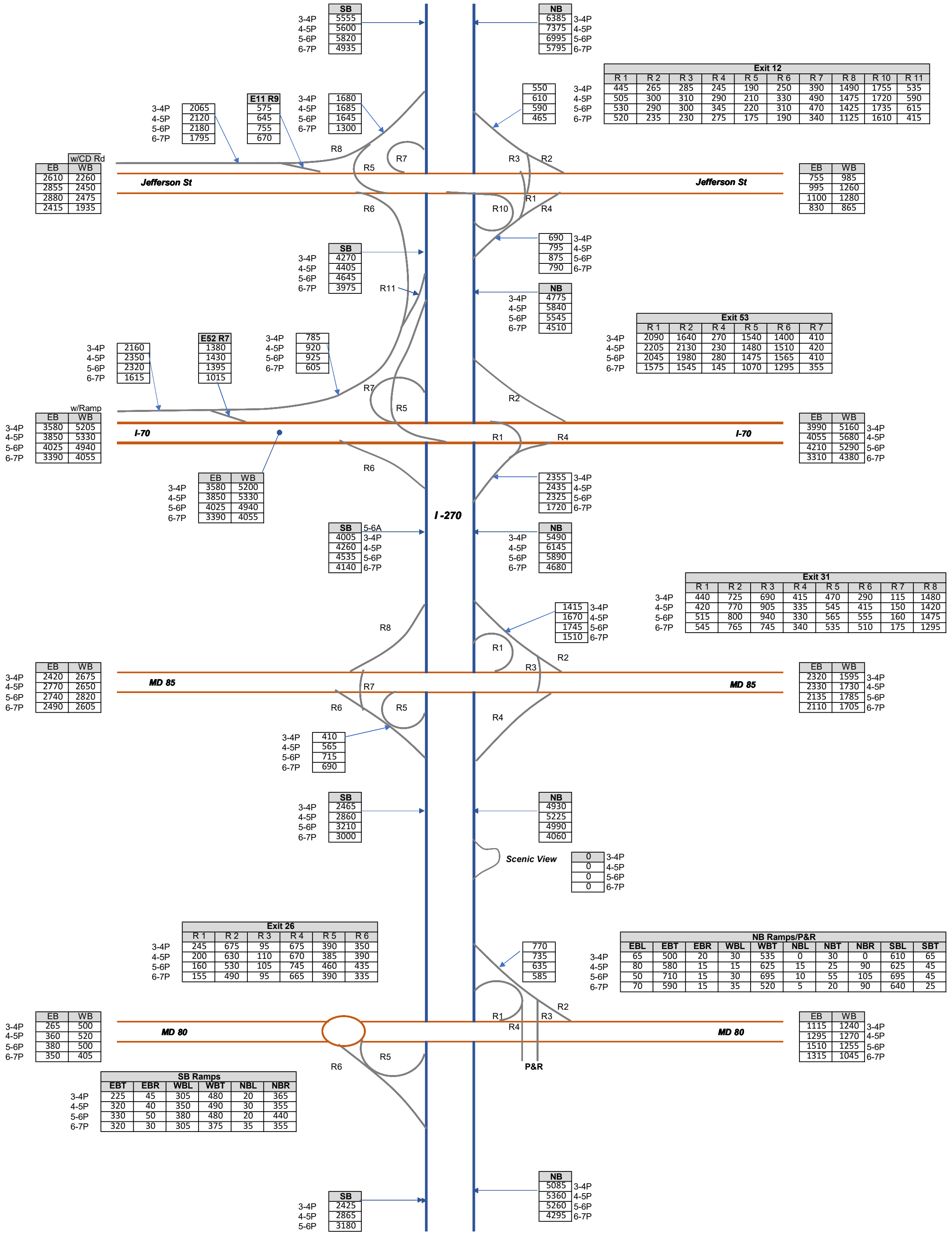
	Ramp 21	Ramp 20
6-7A	55	95
7-8A	75	105
8-9A	80	65
9-10A	115	60

Ramp 26
0
0
0
0

MD 210	
SB	NB
1740	5040
2185	4980
1960	4085
1810	3145

	National Harbor Blvd	
	SB	NB
6-7A	720	415
7-8A	805	515
8-9A	960	650
9-10A	825	665

I-270 & I-495 West Side PM
Future Alternative No Build Peak Period Volumes



Jefferson St (w/CD Rd)

	EB	WB
	2610	2260
	2855	2450
	2880	2475
	2415	1935

Jefferson St

EB	WB	
755	985	
995	1260	
1100	1280	
830	865	

Exit 12										
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 10	R 11
3-4P	445	265	285	245	190	250	390	1490	1755	535
4-5P	505	300	310	290	210	330	490	1475	1720	590
5-6P	530	290	300	345	220	310	470	1425	1735	615
6-7P	520	235	230	275	175	190	340	1125	1610	415

Exit 53						
	R 1	R 2	R 4	R 5	R 6	R 7
3-4P	2090	1640	270	1540	1400	410
4-5P	2205	2130	230	1480	1510	420
5-6P	2045	1980	280	1475	1565	410
6-7P	1575	1545	145	1070	1295	355

I-70 (w/Ramp)

	EB	WB
3-4P	3580	5205
4-5P	3850	5330
5-6P	4025	4940
6-7P	3390	4055

	EB	WB
3-4P	3580	5200
4-5P	3850	5330
5-6P	4025	4940
6-7P	3390	4055

EB	WB	
3990	5160	3-4P
4055	5680	4-5P
4210	5290	5-6P
3310	4380	6-7P

Exit 31								
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	440	725	690	415	470	290	115	1480
4-5P	420	770	905	335	545	415	150	1420
5-6P	515	800	940	330	565	555	160	1475
6-7P	545	765	745	340	535	510	175	1295

MD 85

	EB	WB
3-4P	2420	2675
4-5P	2770	2650
5-6P	2740	2820
6-7P	2490	2605

EB	WB	
2320	1595	3-4P
2330	1730	4-5P
2135	1785	5-6P
2110	1705	6-7P

Exit 26						
	R 1	R 2	R 3	R 4	R 5	R 6
3-4P	245	675	95	675	390	350
4-5P	200	630	110	670	385	390
5-6P	160	530	105	745	460	435
6-7P	155	490	95	665	390	335

NB Ramps/P&R										
	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
3-4P	65	500	20	30	535	0	30	0	610	65
4-5P	80	580	15	15	625	15	25	90	625	45
5-6P	50	710	15	30	695	10	55	105	695	45
6-7P	70	590	15	35	520	5	20	90	640	25

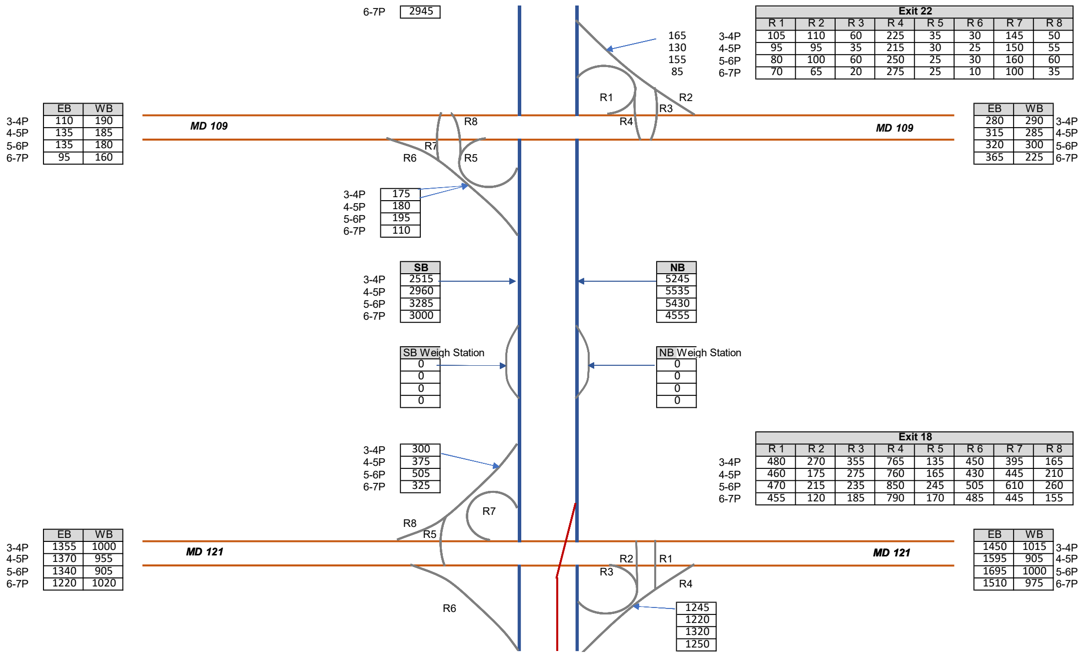
MD 80

	EB	WB
3-4P	265	500
4-5P	360	520
5-6P	380	500
6-7P	350	405

EB	WB	
1115	1240	3-4P
1295	1270	4-5P
1510	1255	5-6P
1315	1045	6-7P

SB Ramps						
	EBT	EBR	WBL	WBT	NBL	NBR
3-4P	225	45	305	480	20	365
4-5P	320	40	350	490	30	355
5-6P	330	50	380	480	20	440
6-7P	320	30	305	375	35	355

I-270 & I-495 West Side PM
Future Alternative No Build Peak Period Volumes



	6-7P
	2945

	Exit 22							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	105	110	60	225	35	30	145	50
4-5P	95	95	35	215	30	25	150	55
5-6P	80	100	60	250	25	30	160	60
6-7P	70	65	20	275	25	10	100	35

3-4P	165
4-5P	130
5-6P	155
6-7P	85

MD 109 (west):

	EB	WB
3-4P	110	190
4-5P	135	185
5-6P	135	180
6-7P	95	160

MD 109 (east):

EB	WB	
280	290	3-4P
315	285	4-5P
320	300	5-6P
365	225	6-7P

3-4P	175
4-5P	180
5-6P	195
6-7P	110

	SB
3-4P	2515
4-5P	2960
5-6P	3285
6-7P	3000

NB
5245
5535
5430
4555

SB Weigh Station
0
0
0
0

NB Weigh Station
0
0
0
0

3-4P	300
4-5P	375
5-6P	505
6-7P	325

	Exit 18							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	480	270	355	765	135	450	395	165
4-5P	460	175	275	760	165	430	445	210
5-6P	470	215	235	850	245	505	610	260
6-7P	455	120	185	790	170	485	445	155

MD 121 (west):

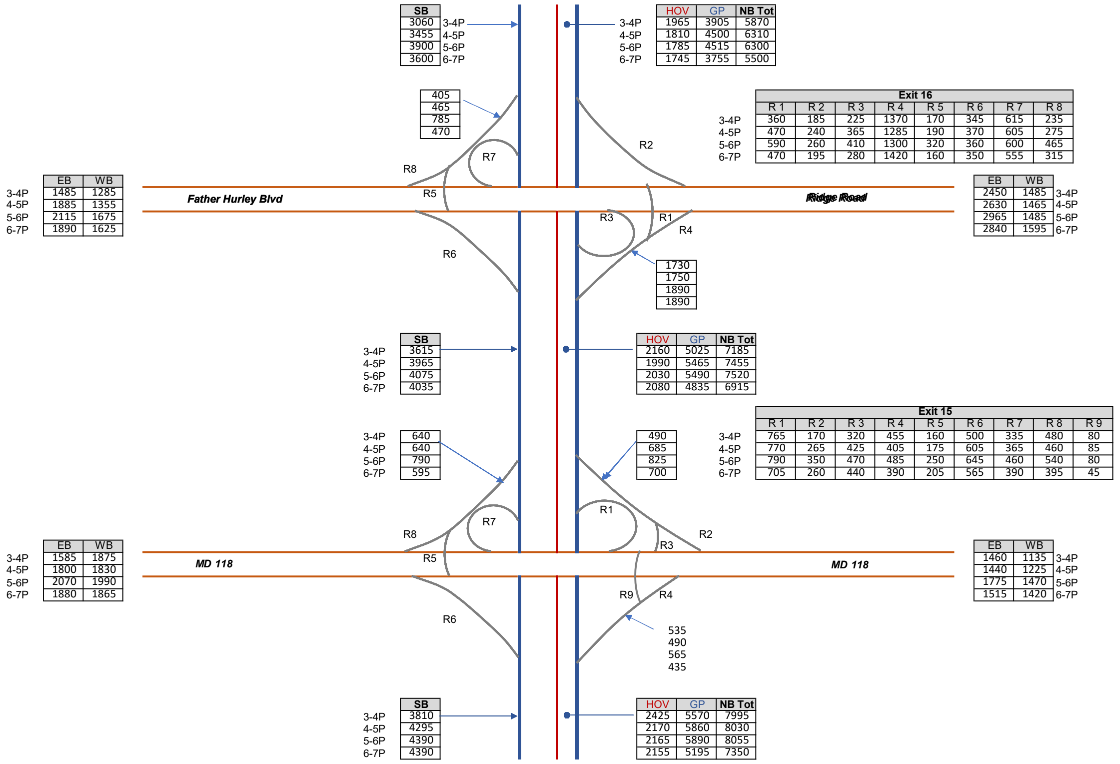
	EB	WB
3-4P	1355	1000
4-5P	1370	955
5-6P	1340	905
6-7P	1220	1020

MD 121 (east):

EB	WB	
1450	1015	3-4P
1595	905	4-5P
1695	1000	5-6P
1510	975	6-7P

1245
1220
1320
1250

I-270 & I-495 West Side PM
Future Alternative No Build Peak Period Volumes



SB	
3060	3-4P
3455	4-5P
3900	5-6P
3600	6-7P

	HOV	GP	NB Tot
3-4P	1965	3905	5870
4-5P	1810	4500	6310
5-6P	1785	4515	6300
6-7P	1745	3755	5500

	Exit 16							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	360	185	225	1370	170	345	615	235
4-5P	470	240	365	1285	190	370	605	275
5-6P	590	260	410	1300	320	360	600	465
6-7P	470	195	280	1420	160	350	555	315

405
465
785
470

	EB	WB
3-4P	1485	1285
4-5P	1885	1355
5-6P	2115	1675
6-7P	1890	1625

EB	WB	
2450	1485	3-4P
2630	1465	4-5P
2965	1485	5-6P
2840	1595	6-7P

1730
1750
1890
1890

	SB
3-4P	3615
4-5P	3965
5-6P	4075
6-7P	4035

HOV	GP	NB Tot
2160	5025	7185
1990	5465	7455
2030	5490	7520
2080	4835	6915

	Exit 15								
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9
3-4P	765	170	320	455	160	500	335	480	80
4-5P	770	265	425	405	175	605	365	460	85
5-6P	790	350	470	485	250	645	460	540	80
6-7P	705	260	440	390	205	565	390	395	45

3-4P	640
4-5P	640
5-6P	790
6-7P	595

490
685
825
700

	EB	WB
3-4P	1585	1875
4-5P	1800	1830
5-6P	2070	1990
6-7P	1880	1865

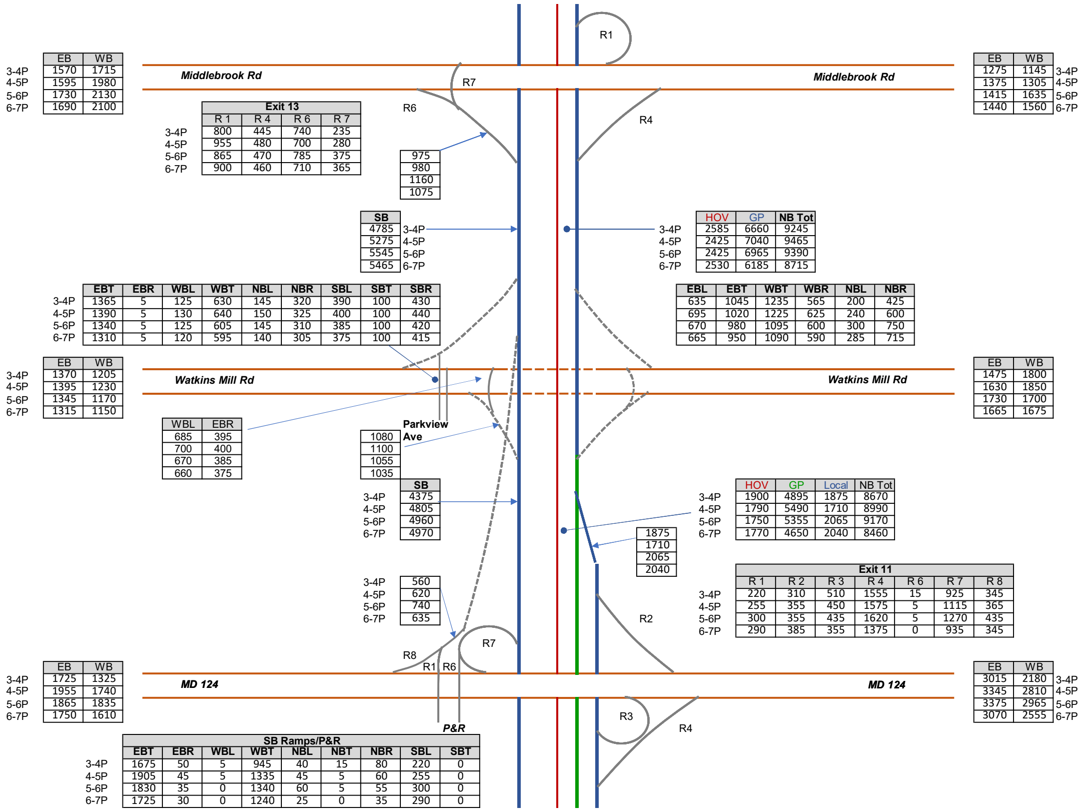
EB	WB	
1460	1135	3-4P
1440	1225	4-5P
1775	1470	5-6P
1515	1420	6-7P

535
490
565
435

	SB
3-4P	3810
4-5P	4295
5-6P	4390
6-7P	4390

HOV	GP	NB Tot
2425	5570	7995
2170	5860	8030
2165	5890	8055
2155	5195	7350

I-270 & I-495 West Side PM
Future Alternative No Build Peak Period Volumes



Middlebrook Rd (west)

	EB	WB
3-4P	1570	1715
4-5P	1595	1980
5-6P	1730	2130
6-7P	1690	2100

Middlebrook Rd (east)

	EB	WB
3-4P	1275	1145
4-5P	1375	1305
5-6P	1415	1635
6-7P	1440	1560

Exit 13

	R 1	R 4	R 6	R 7
3-4P	800	445	740	235
4-5P	955	480	700	280
5-6P	865	470	785	375
6-7P	900	460	710	365

975
980
1160
1075

SB	
4785	3-4P
5275	4-5P
5545	5-6P
5465	6-7P

	HOV	GP	NB Tot
3-4P	2585	6660	9245
4-5P	2425	7040	9465
5-6P	2425	6965	9390
6-7P	2530	6185	8715

	EBT	EBR	WBL	WBT	NBL	NBR	SBL	SBT	SBR
3-4P	1365	5	125	630	145	320	390	100	430
4-5P	1390	5	130	640	150	325	400	100	440
5-6P	1340	5	125	605	145	310	385	100	420
6-7P	1310	5	120	595	140	305	375	100	415

EBL	EBT	WBT	WBR	NBL	NBR
635	1045	1235	565	200	425
695	1020	1225	625	240	600
670	980	1095	600	300	750
665	950	1090	590	285	715

Watkins Mill Rd (west)

	EB	WB
3-4P	1370	1205
4-5P	1395	1230
5-6P	1345	1170
6-7P	1315	1150

Watkins Mill Rd (east)

EB	WB
1475	1800
1630	1850
1730	1700
1665	1675

WBL	EBR
685	395
700	400
670	385
660	375

Parkview Ave

1080
1100
1055
1035

	SB
3-4P	4375
4-5P	4805
5-6P	4960
6-7P	4970

	HOV	GP	Local	NB Tot
3-4P	1900	4895	1875	8670
4-5P	1790	5490	1710	8990
5-6P	1750	5355	2065	9170
6-7P	1770	4650	2040	8460

1875
1710
2065
2040

3-4P	560
4-5P	620
5-6P	740
6-7P	635

Exit 11

	R 1	R 2	R 3	R 4	R 6	R 7	R 8
3-4P	220	310	510	1555	15	925	345
4-5P	255	355	450	1575	5	1115	365
5-6P	300	355	435	1620	5	1270	435
6-7P	290	385	355	1375	0	935	345

MD 124 (west)

	EB	WB
3-4P	1725	1325
4-5P	1955	1740
5-6P	1865	1835
6-7P	1750	1610

MD 124 (east)

	EB	WB
3-4P	3015	2180
4-5P	3345	2810
5-6P	3375	2965
6-7P	3070	2555

SB Ramps/P&R

	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
3-4P	1675	50	5	945	40	15	80	220	0
4-5P	1905	45	5	1335	45	5	60	255	0
5-6P	1830	35	0	1340	60	5	55	300	0
6-7P	1725	30	0	1240	25	0	35	290	0

I-270 & I-495 West Side PM
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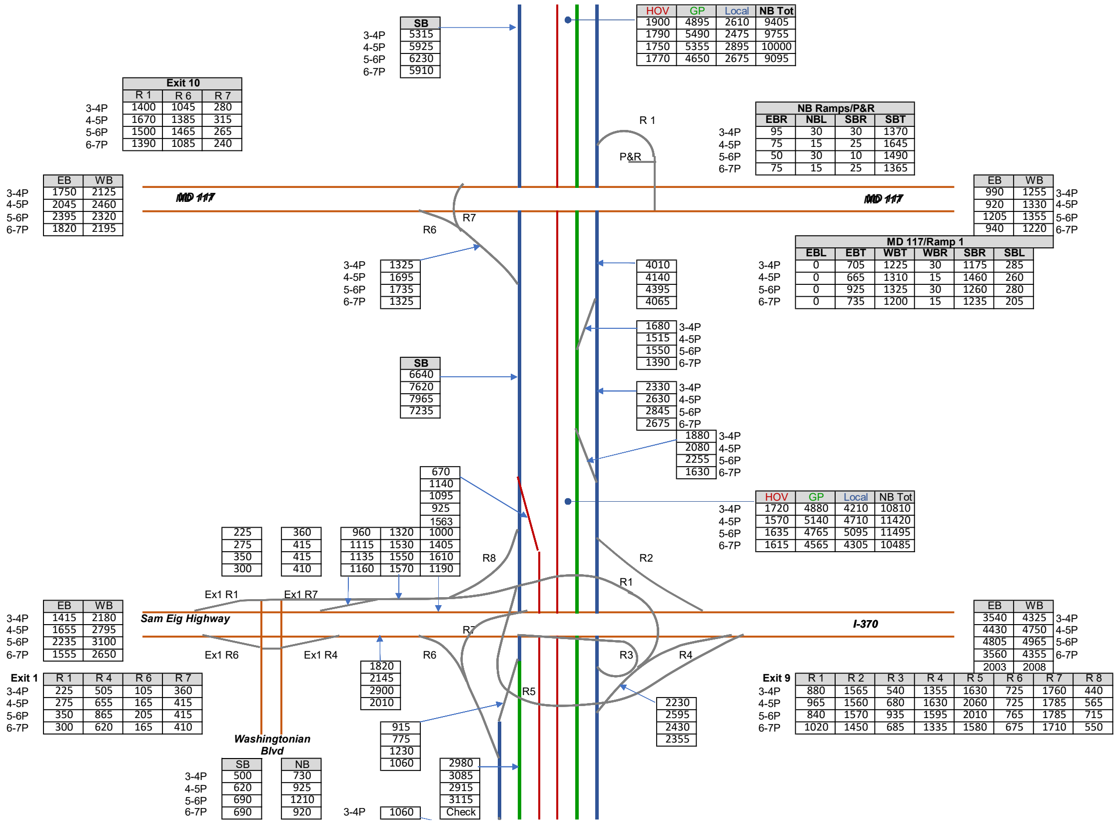

	SB
3-4P	5315
4-5P	5925
5-6P	6230
6-7P	5910

HOV	GP	Local	NB Tot
1900	4895	2610	9405
1790	5490	2475	9755
1750	5355	2895	10000
1770	4650	2675	9095

	Exit 10		
	R 1	R 6	R 7
3-4P	1400	1045	280
4-5P	1670	1385	315
5-6P	1500	1465	265
6-7P	1390	1085	240

	NB Ramps/P&R			
	EBR	NBL	SBR	SBT
3-4P	95	30	30	1370
4-5P	75	15	25	1645
5-6P	50	30	10	1490
6-7P	75	15	25	1365

	EB	WB
3-4P	1750	2125
4-5P	2045	2460
5-6P	2395	2320
6-7P	1820	2195

EB	WB	
990	1255	3-4P
920	1330	4-5P
1205	1355	5-6P
940	1220	6-7P

	MD 117/Ramp 1					
	EBL	EBT	WBT	WBR	SBR	SBL
3-4P	0	705	1225	30	1175	285
4-5P	0	665	1310	15	1460	260
5-6P	0	925	1325	30	1260	280
6-7P	0	735	1200	15	1235	205

3-4P	1325
4-5P	1695
5-6P	1735
6-7P	1325

4010
4140
4395
4065

1680	3-4P
1515	4-5P
1550	5-6P
1390	6-7P

SB
6640
7620
7965
7235

2330	3-4P
2630	4-5P
2845	5-6P
2675	6-7P

1880	3-4P
2080	4-5P
2255	5-6P
1630	6-7P

	HOV	GP	Local	NB Tot
3-4P	1720	4880	4210	10810
4-5P	1570	5140	4710	11420
5-6P	1635	4765	5095	11495
6-7P	1615	4565	4305	10485

670
1140
1095
925
1563

225	360	960	1320	1000
275	415	1115	1530	1405
350	415	1135	1550	1610
300	410	1160	1570	1190

	EB	WB
3-4P	1415	2180
4-5P	1655	2795
5-6P	2235	3100
6-7P	1555	2650

Exit 1	R 1	R 4	R 6	R 7
3-4P	225	505	105	360
4-5P	275	655	165	415
5-6P	350	865	205	415
6-7P	300	620	165	410

1820
2145
2900
2010

915
775
1230
1060

	SB	NB
3-4P	500	730
4-5P	620	925
5-6P	690	1210
6-7P	690	920

3-4P	1060

2980
3085
2915
3115
Check

2230
2595
2430
2355

EB	WB	
3540	4325	3-4P
4430	4750	4-5P
4805	4965	5-6P
3560	4355	6-7P
2003	2008	

Exit 9	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	880	1565	540	1355	1630	725	1760	440
4-5P	965	1560	680	1630	2060	725	1785	565
5-6P	840	1570	935	1595	2010	765	1785	715
6-7P	1020	1450	685	1335	1580	675	1710	550

I-270 & I-495 West Side PM
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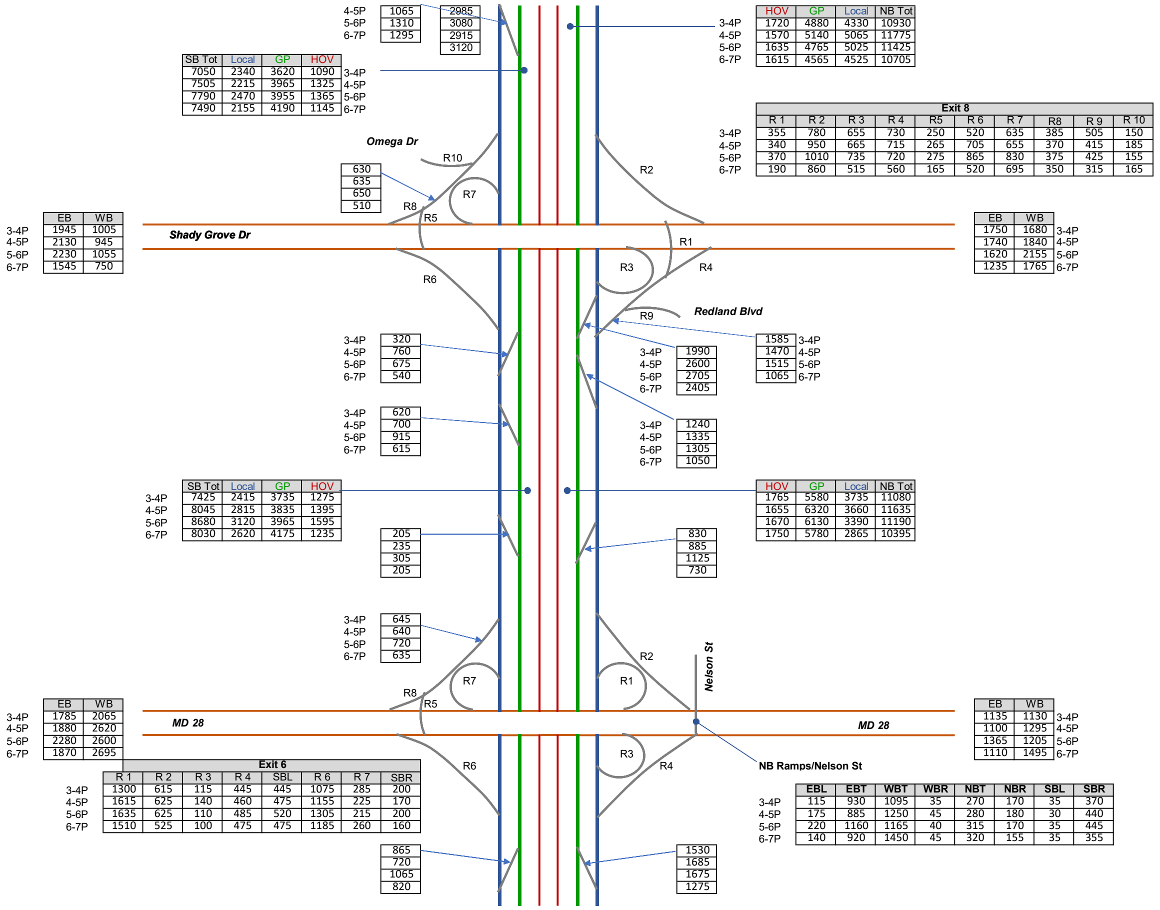


	SB Tot	Local	GP	HOV
3-4P	7050	2340	3620	1090
4-5P	7505	2215	3965	1325
5-6P	7790	2470	3955	1365
6-7P	7490	2155	4190	1145

	HOV	GP	Local	NB Tot
3-4P	1720	4880	4330	10930
4-5P	1570	5140	5065	11775
5-6P	1635	4765	5025	11425
6-7P	1615	4565	4525	10705

	Exit 8									
	R 1	R 2	R 3	R 4	R5	R 6	R 7	R8	R 9	R 10
3-4P	355	780	655	730	250	520	635	385	505	150
4-5P	340	950	665	715	265	705	655	370	415	185
5-6P	370	1010	735	720	275	865	830	375	425	155
6-7P	190	860	515	560	165	520	695	350	315	165

	EB	WB
3-4P	1945	1005
4-5P	2130	945
5-6P	2230	1055
6-7P	1545	750

	EB	WB
3-4P	1750	1680
4-5P	1740	1840
5-6P	1620	2155
6-7P	1235	1765

	SB Tot	Local	GP	HOV
3-4P	7425	2415	3735	1275
4-5P	8045	2815	3835	1395
5-6P	8680	3120	3965	1595
6-7P	8030	2620	4175	1235

HOV	GP	Local	NB Tot
1765	5580	3735	11080
1655	6320	3660	11635
1670	6130	3390	11190
1750	5780	2865	10395

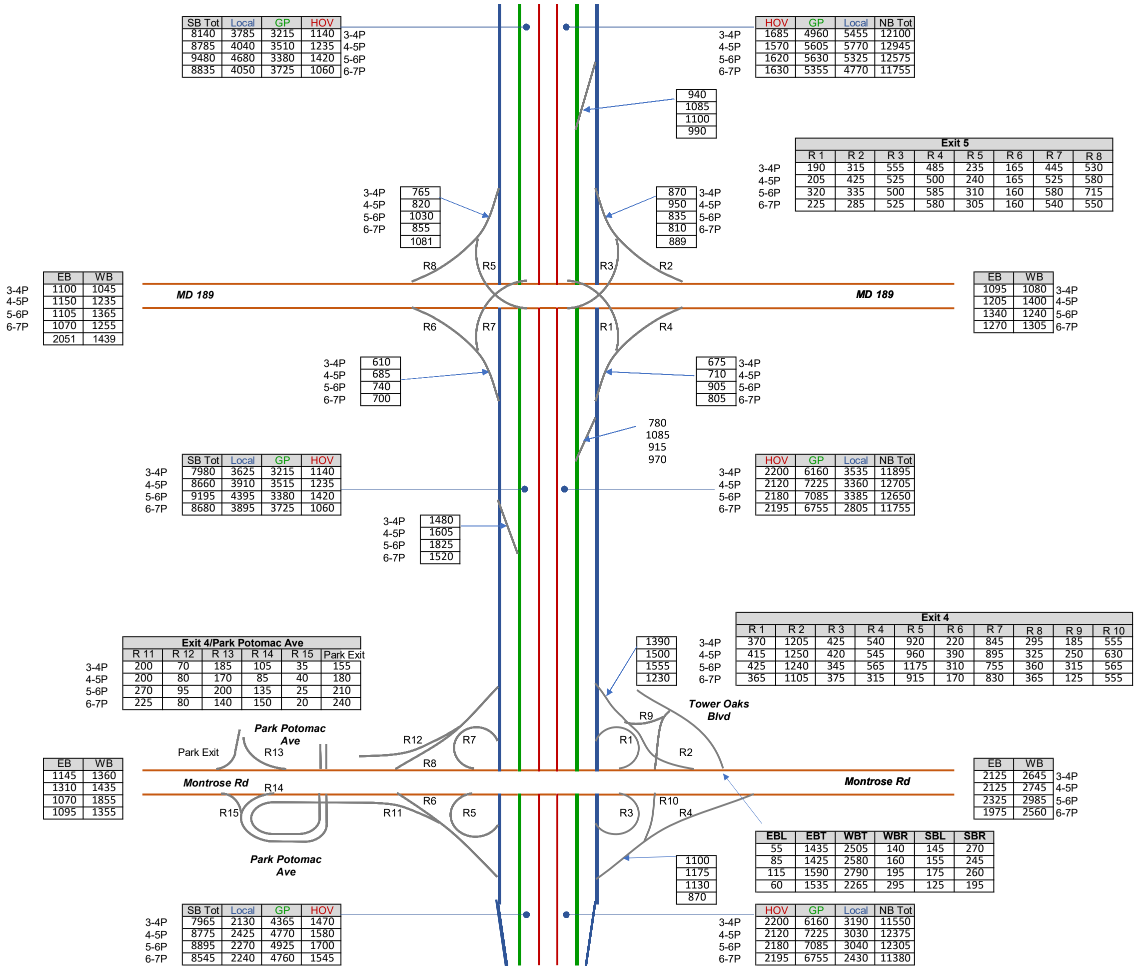
	EB	WB
3-4P	1785	2065
4-5P	1880	2620
5-6P	2280	2600
6-7P	1870	2695

	EB	WB
3-4P	1135	1130
4-5P	1100	1295
5-6P	1365	1205
6-7P	1110	1495

	Exit 6							
	R 1	R 2	R 3	R 4	SBL	R 6	R 7	SBR
3-4P	1300	615	115	445	445	1075	285	200
4-5P	1615	625	140	460	475	1155	225	170
5-6P	1635	625	110	485	520	1305	215	200
6-7P	1510	525	100	475	475	1185	260	160

	EBL	EBT	WBT	WBR	NBT	NBR	SBL	SBR
3-4P	115	930	1095	35	270	170	35	370
4-5P	175	885	1250	45	280	180	30	440
5-6P	220	1160	1165	40	315	170	35	445
6-7P	140	920	1450	45	320	155	35	355

I-270 & I-495 West Side PM
Future Alternative No Build Peak Period Volumes



	SB Tot	Local	GP	HOV
3-4P	8140	3785	3215	1140
4-5P	8785	4040	3510	1235
5-6P	9480	4680	3380	1420
6-7P	8835	4050	3725	1060

	HOV	GP	Local	NB Tot
3-4P	1685	4960	5455	12100
4-5P	1570	5605	5770	12945
5-6P	1620	5630	5325	12575
6-7P	1630	5355	4770	11755

940
1085
1100
990

	Exit 5							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	190	315	555	485	235	165	445	530
4-5P	205	425	525	500	240	165	525	580
5-6P	320	335	500	585	310	160	580	715
6-7P	225	285	525	580	305	160	540	550

3-4P	765
4-5P	820
5-6P	1030
6-7P	855
	1081

870	3-4P
950	4-5P
835	5-6P
810	6-7P
889	

	EB	WB
3-4P	1100	1045
4-5P	1150	1235
5-6P	1105	1365
6-7P	1070	1255
	2051	1439

EB	WB	
1095	1080	3-4P
1205	1400	4-5P
1340	1240	5-6P
1270	1305	6-7P

3-4P	610
4-5P	685
5-6P	740
6-7P	700

675	3-4P
710	4-5P
905	5-6P
805	6-7P

780
1085
915
970

	SB Tot	Local	GP	HOV
3-4P	7980	3625	3215	1140
4-5P	8660	3910	3515	1235
5-6P	9195	4395	3380	1420
6-7P	8680	3895	3725	1060

	HOV	GP	Local	NB Tot
3-4P	2200	6160	3535	11895
4-5P	2120	7225	3360	12705
5-6P	2180	7085	3385	12650
6-7P	2195	6755	2805	11755

3-4P	1480
4-5P	1605
5-6P	1825
6-7P	1520

	Exit 4									
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10
3-4P	370	1205	425	540	920	220	845	295	185	555
4-5P	415	1250	420	545	960	390	895	325	250	630
5-6P	425	1240	345	565	1175	310	755	360	315	565
6-7P	365	1105	375	315	915	170	830	365	125	555

1390
1500
1555
1230

	Exit 4/Park Potomac Ave					
	R 11	R 12	R 13	R 14	R 15	Park Exit
3-4P	200	70	185	105	35	155
4-5P	200	80	170	85	40	180
5-6P	270	95	200	135	25	210
6-7P	225	80	140	150	20	240

	EB	WB
3-4P	1145	1360
4-5P	1310	1435
5-6P	1070	1855
6-7P	1095	1355

EB	WB	
2125	2645	3-4P
2125	2745	4-5P
2325	2985	5-6P
1975	2560	6-7P

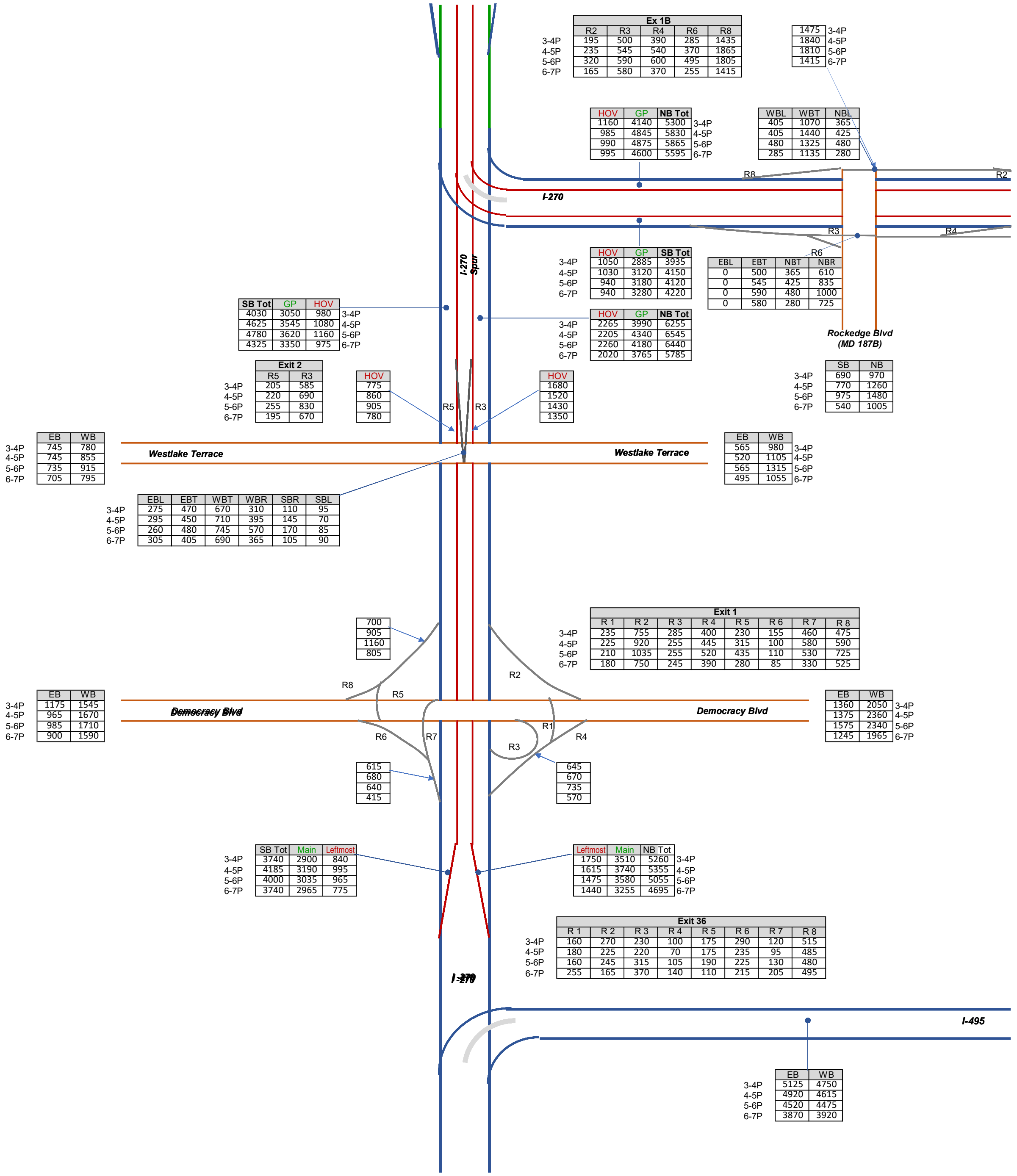
EBL	EBT	WBT	WBR	SBL	SBR
55	1435	2505	140	145	270
85	1425	2580	160	155	245
115	1590	2790	195	175	260
60	1535	2265	295	125	195

1100
1175
1130
870

	SB Tot	Local	GP	HOV
3-4P	7965	2130	4365	1470
4-5P	8775	2425	4770	1580
5-6P	8895	2270	4925	1700
6-7P	8545	2240	4760	1545

	HOV	GP	Local	NB Tot
3-4P	2200	6160	3190	11550
4-5P	2120	7225	3030	12375
5-6P	2180	7085	3040	12305
6-7P	2195	6755	2430	11380

I-270 & I-495 West Side PM
Future Alternative No Build Peak Period Volumes



	Ex 1B				
	R2	R3	R4	R6	R8
3-4P	195	500	390	285	1435
4-5P	235	545	540	370	1865
5-6P	320	590	600	495	1805
6-7P	165	580	370	255	1415

1475	3-4P
1840	4-5P
1810	5-6P
1415	6-7P

HOV	GP	NB Tot	
1160	4140	5300	3-4P
985	4845	5830	4-5P
990	4875	5865	5-6P
995	4600	5595	6-7P

WBL	WBT	NBL
405	1070	365
405	1440	425
480	1325	480
285	1135	280

	HOV	GP	SB Tot
3-4P	1050	2885	3935
4-5P	1030	3120	4150
5-6P	940	3180	4120
6-7P	940	3280	4220

EBL	EBT	NBT	NBR
0	500	365	610
0	545	425	835
0	590	480	1000
0	580	280	725

SB Tot	GP	HOV	
4030	3050	980	3-4P
4625	3545	1080	4-5P
4780	3620	1160	5-6P
4325	3350	975	6-7P

	HOV	GP	NB Tot
3-4P	2265	3990	6255
4-5P	2205	4340	6545
5-6P	2260	4180	6440
6-7P	2020	3765	5785

	Exit 2	
	R5	R3
3-4P	205	585
4-5P	220	690
5-6P	255	830
6-7P	195	670

HOV
775
860
905
780

HOV
1680
1520
1430
1350

	SB	NB
3-4P	690	970
4-5P	770	1260
5-6P	975	1480
6-7P	540	1005

	EB	WB
3-4P	745	780
4-5P	745	855
5-6P	735	915
6-7P	705	795

EB	WB	
565	980	3-4P
520	1105	4-5P
565	1315	5-6P
495	1055	6-7P

	EBL	EBT	WBT	WBR	SBR	SBL
3-4P	275	470	670	310	110	95
4-5P	295	450	710	395	145	70
5-6P	260	480	745	570	170	85
6-7P	305	405	690	365	105	90

700
905
1160
805

	Exit 1							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	235	755	285	400	230	155	460	475
4-5P	225	920	255	445	315	100	580	590
5-6P	210	1035	255	520	435	110	530	725
6-7P	180	750	245	390	280	85	330	525

	EB	WB
3-4P	1175	1545
4-5P	965	1670
5-6P	985	1710
6-7P	900	1590

EB	WB	
1360	2050	3-4P
1375	2360	4-5P
1575	2340	5-6P
1245	1965	6-7P

615
680
640
415

645
670
735
570

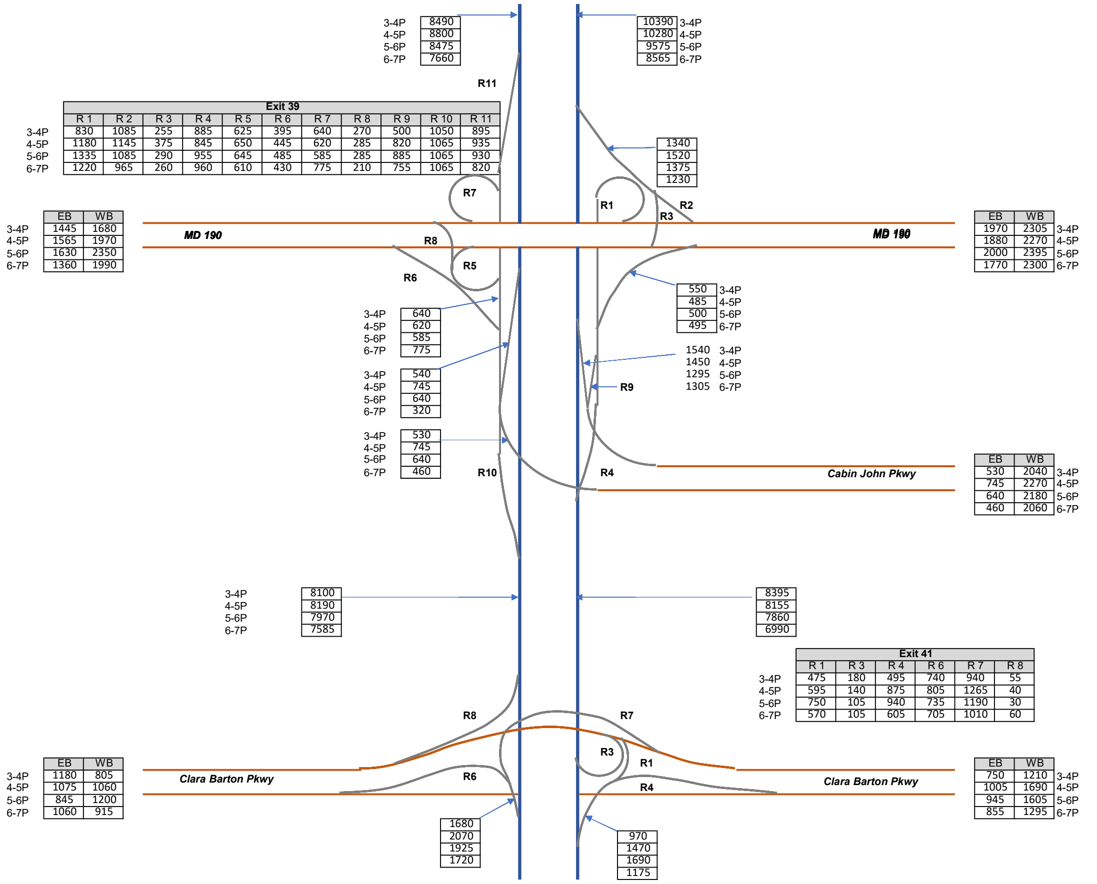
	SB Tot	Main	Leftmost
3-4P	3740	2900	840
4-5P	4185	3190	995
5-6P	4000	3035	965
6-7P	3740	2965	775

Leftmost	Main	NB Tot	
1750	3510	5260	3-4P
1615	3740	5355	4-5P
1475	3580	5055	5-6P
1440	3255	4695	6-7P

	Exit 36							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	160	270	230	100	175	290	120	515
4-5P	180	225	220	70	175	235	95	485
5-6P	160	245	315	105	190	225	130	480
6-7P	255	165	370	140	110	215	205	495

	EB	WB
3-4P	5125	4750
4-5P	4920	4615
5-6P	4520	4475
6-7P	3870	3920

I-270 & I-495 West Side PM
Future Alternative No Build Peak Period Volumes



	Exit 39										
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11
3-4P	830	1085	255	885	625	395	640	270	500	1050	895
4-5P	1180	1145	375	845	650	445	620	285	820	1065	935
5-6P	1335	1085	290	955	645	485	585	285	885	1065	930
6-7P	1220	965	260	960	610	430	775	210	755	1065	820

	EB	WB
3-4P	1445	1680
4-5P	1565	1970
5-6P	1630	2350
6-7P	1360	1990

EB	WB	
1970	2305	3-4P
1880	2270	4-5P
2000	2395	5-6P
1770	2300	6-7P

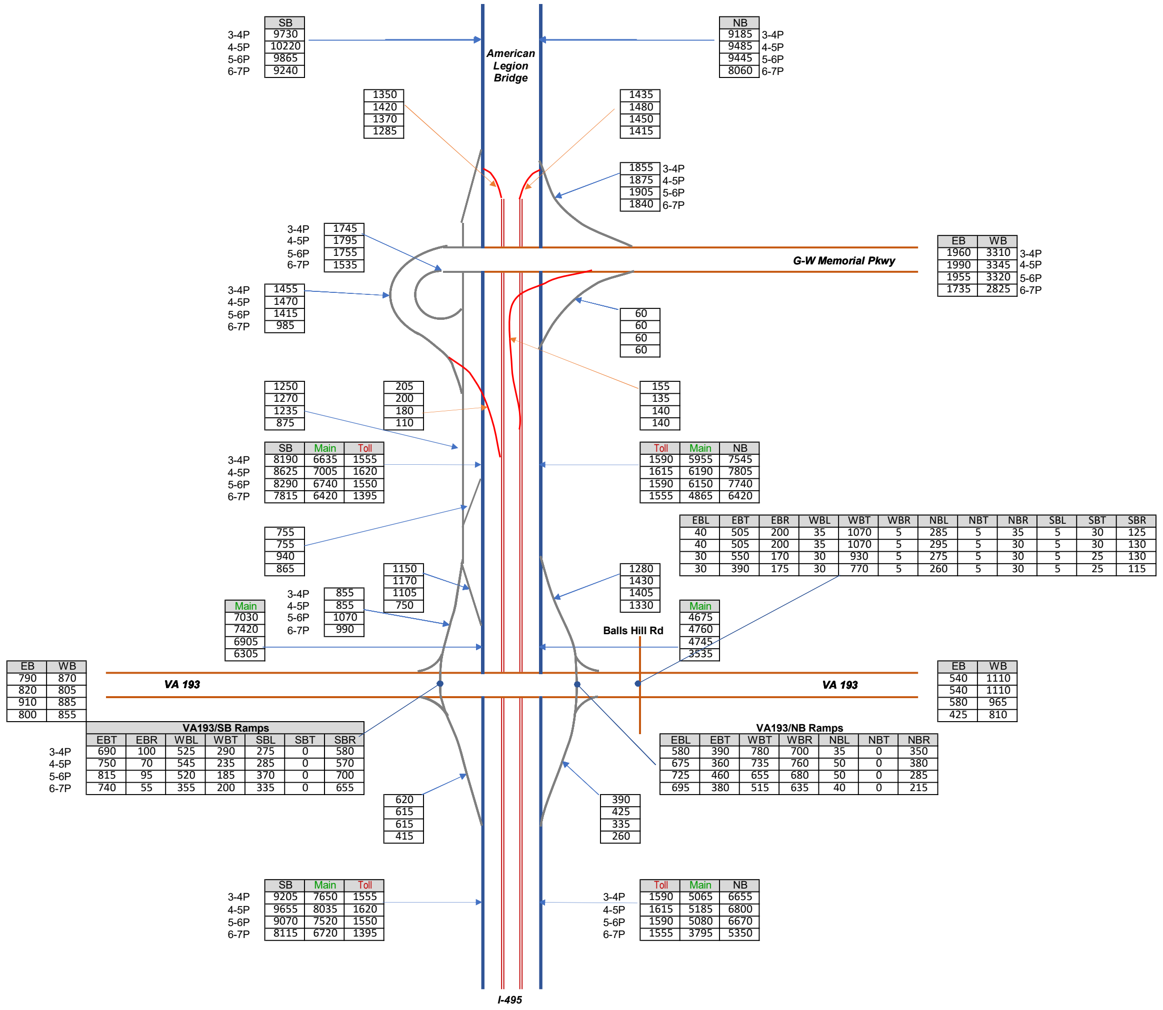
EB	WB	
530	2040	3-4P
745	2270	4-5P
640	2180	5-6P
460	2060	6-7P

	Exit 41					
	R 1	R 3	R 4	R 6	R 7	R 8
3-4P	475	180	495	740	940	55
4-5P	595	140	875	805	1265	40
5-6P	750	105	940	735	1190	30
6-7P	570	105	605	705	1010	60

	EB	WB
3-4P	1180	805
4-5P	1075	1060
5-6P	845	1200
6-7P	1060	915

EB	WB	
750	1210	3-4P
1005	1690	4-5P
945	1605	5-6P
855	1295	6-7P

I-270 & I-495 West Side PM
Future Alternative No Build Peak Period Volumes



	SB
3-4P	9730
4-5P	10220
5-6P	9865
6-7P	9240

NB	
9185	3-4P
9485	4-5P
9445	5-6P
8060	6-7P

1350
1420
1370
1285

1435
1480
1450
1415

1855	3-4P
1875	4-5P
1905	5-6P
1840	6-7P

3-4P	1745
4-5P	1795
5-6P	1755
6-7P	1535

EB	WB	
1960	3310	3-4P
1990	3345	4-5P
1955	3320	5-6P
1735	2825	6-7P

3-4P	1455
4-5P	1470
5-6P	1415
6-7P	985

60
60
60
60

1250
1270
1235
875

205
200
180
110

155
135
140
140

	SB	Main	Toll
3-4P	8190	6635	1555
4-5P	8625	7005	1620
5-6P	8290	6740	1550
6-7P	7815	6420	1395

Toll	Main	NB
1590	5955	7545
1615	6190	7805
1590	6150	7740
1555	4865	6420

EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
40	505	200	35	1070	5	285	5	35	5	30	125
40	505	200	35	1070	5	295	5	30	5	30	130
30	550	170	30	930	5	275	5	30	5	25	130
30	390	175	30	770	5	260	5	30	5	25	115

755
755
940
865

1150
1170
1105
750

1280
1430
1405
1330

Main
7030
7420
6905
6305

3-4P	855
4-5P	855
5-6P	1070
6-7P	990

Main
4675
4760
4745
3535

EB	WB
790	870
820	805
910	885
800	855

EB	WB
540	1110
540	1110
580	965
425	810

VA193/SB Ramps

	EBT	EBR	WBL	WBT	SBL	SBT	SBR
3-4P	690	100	525	290	275	0	580
4-5P	750	70	545	235	285	0	570
5-6P	815	95	520	185	370	0	700
6-7P	740	55	355	200	335	0	655

VA193/NB Ramps

EBL	EBT	WBT	WBR	NBL	NBT	NBR
580	390	780	700	35	0	350
675	360	735	760	50	0	380
725	460	655	680	50	0	285
695	380	515	635	40	0	215

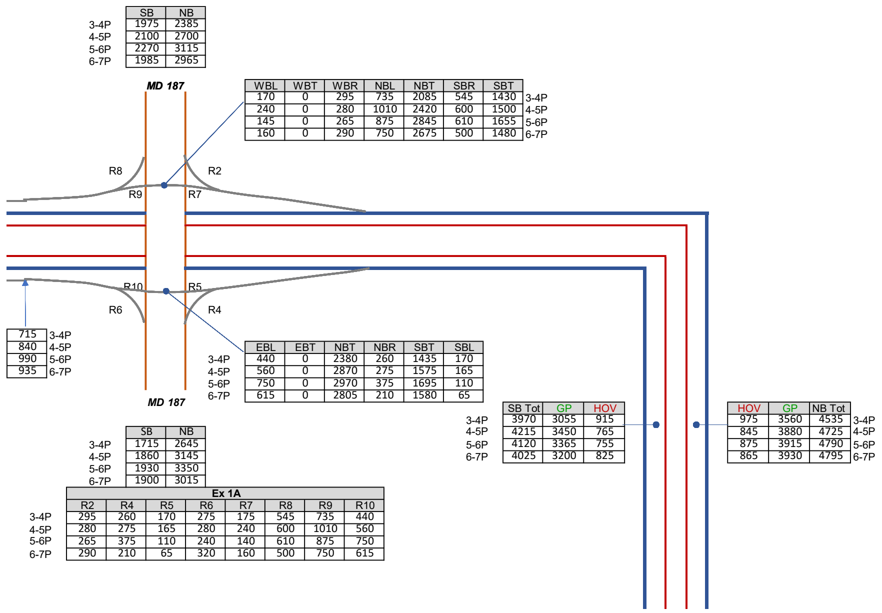
620
615
615
415

390
425
335
260

	SB	Main	Toll
3-4P	9205	7650	1555
4-5P	9655	8035	1620
5-6P	9070	7520	1550
6-7P	8115	6720	1395

	Toll	Main	NB
3-4P	1590	5065	6655
4-5P	1615	5185	6800
5-6P	1590	5080	6670
6-7P	1555	3795	5350

I-270 & I-495 West Side PM
Future Alternative No Build Peak Period Volumes



	SB	NB
3-4P	1975	2385
4-5P	2100	2700
5-6P	2270	3115
6-7P	1985	2965

WBL	WBT	WBR	NBL	NBT	SBR	SBT	
170	0	295	735	2085	545	1430	3-4P
240	0	280	1010	2420	600	1500	4-5P
145	0	265	875	2845	610	1655	5-6P
160	0	290	750	2675	500	1480	6-7P

715	3-4P
840	4-5P
990	5-6P
935	6-7P

	EBL	EBT	NBT	NBR	SBT	SBL
3-4P	440	0	2380	260	1435	170
4-5P	560	0	2870	275	1575	165
5-6P	750	0	2970	375	1695	110
6-7P	615	0	2805	210	1580	65

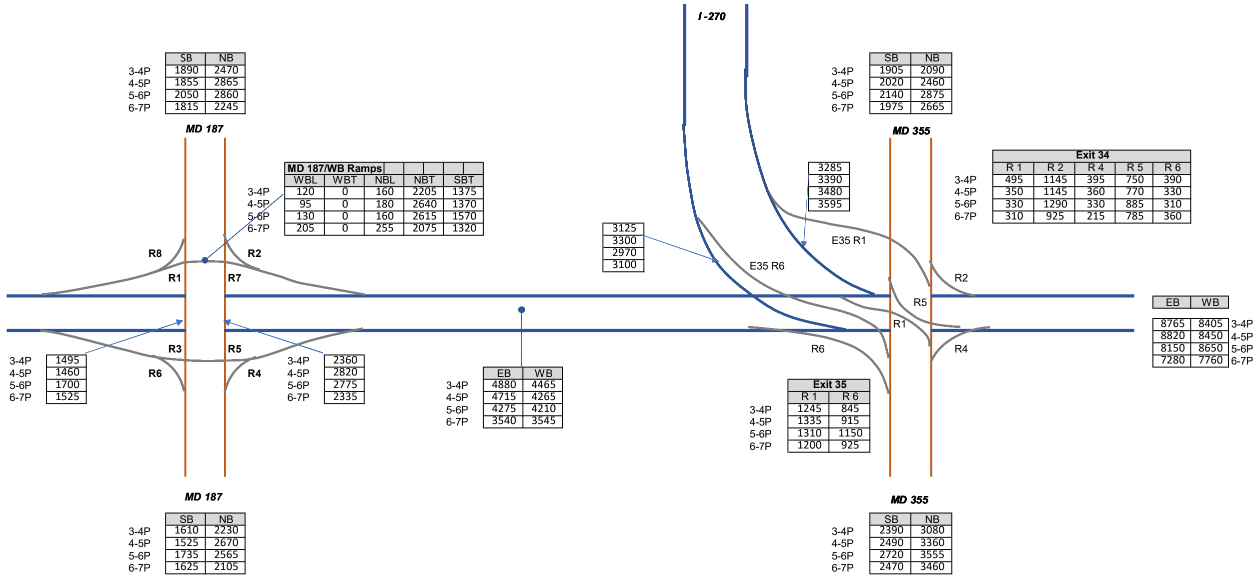
	SB	NB
3-4P	1715	2645
4-5P	1860	3145
5-6P	1930	3350
6-7P	1900	3015

	Ex 1A							
	R2	R4	R5	R6	R7	R8	R9	R10
3-4P	295	260	170	275	175	545	735	440
4-5P	280	275	165	280	240	600	1010	560
5-6P	265	375	110	240	140	610	875	750
6-7P	290	210	65	320	160	500	750	615

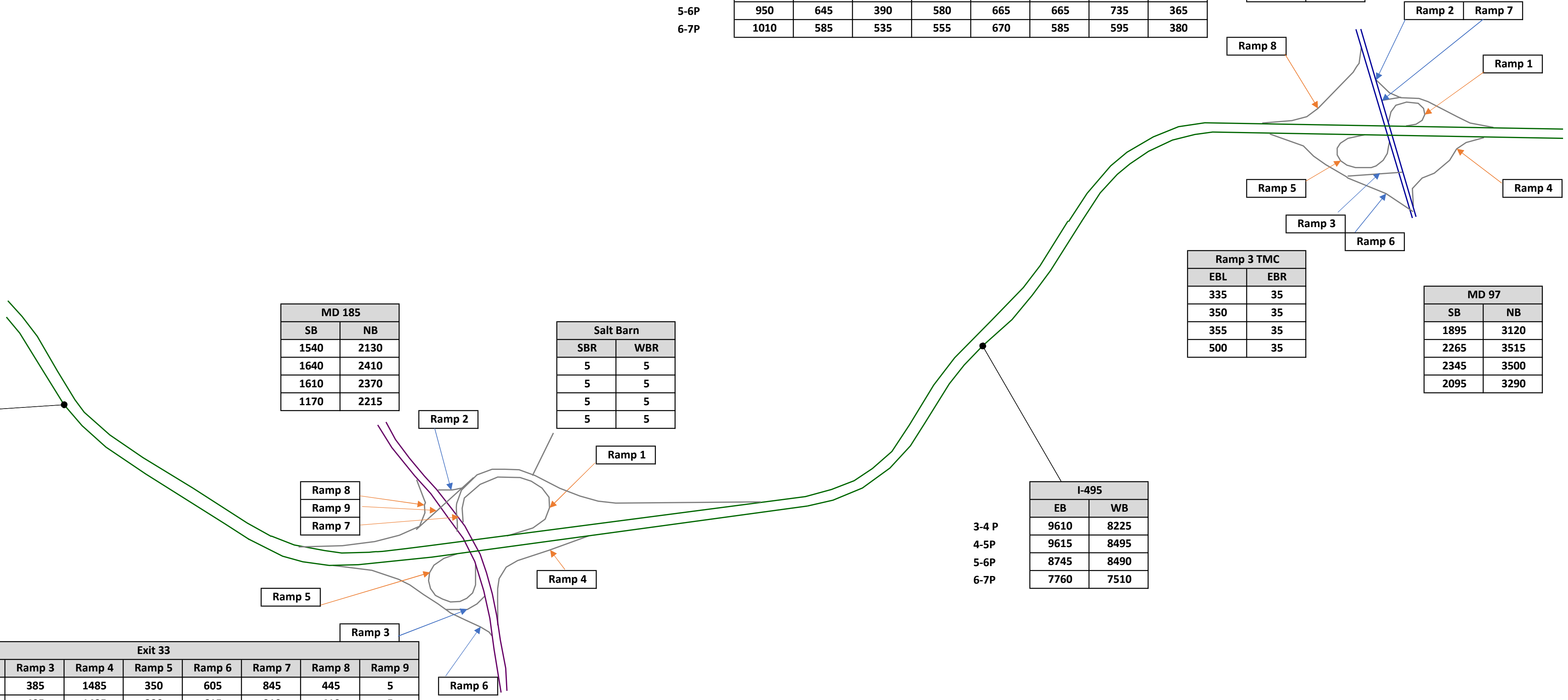
	SB Tot	GP	HOV
3-4P	3970	3055	915
4-5P	4215	3450	765
5-6P	4120	3365	755
6-7P	4025	3200	825

HOV	GP	NB Tot	
975	3560	4535	3-4P
845	3880	4725	4-5P
875	3915	4790	5-6P
865	3930	4795	6-7P

I-270 & I-495 West Side PM
Future Alternative No Build Peak Period Volumes



I-495 North Side PM
Future Alternative No Build Peak Period Volumes



	Exit 31							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
3-4P	1005	585	370	620	685	595	575	410
4-5P	980	665	385	620	660	600	760	430
5-6P	950	645	390	580	665	665	735	365
6-7P	1010	585	535	555	670	585	595	380

MD 97	
SB	NB
1780	2415
1965	2925
1950	2970
1925	2810

Ramp 3 TMC	
EBL	EBR
335	35
350	35
355	35
500	35

MD 97	
SB	NB
1895	3120
2265	3515
2345	3500
2095	3290

MD 185	
SB	NB
1540	2130
1640	2410
1610	2370
1170	2215

Salt Barn	
SBR	WBR
5	5
5	5
5	5
5	5

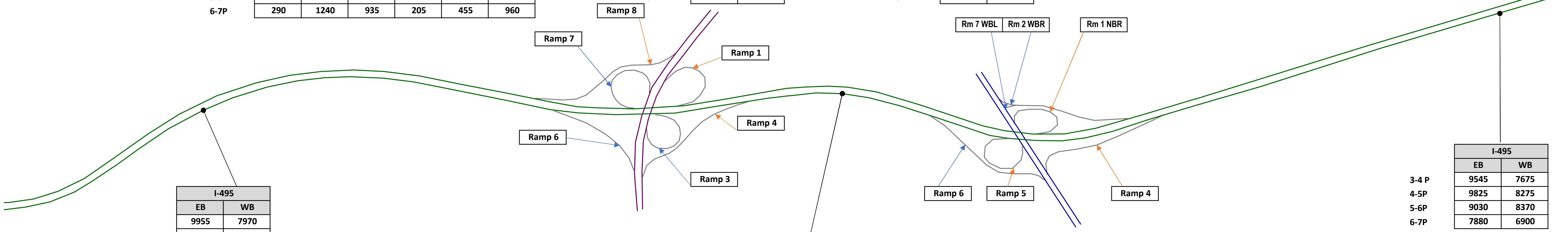
	I-495	
	EB	WB
3-4 P	8765	8405
4-5P	8820	8450
5-6P	8150	8650
6-7P	7280	7760

	I-495	
	EB	WB
3-4 P	9610	8225
4-5P	9615	8495
5-6P	8745	8490
6-7P	7760	7510

	Exit 33								
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9
3-4 P	920	340	385	1485	350	605	845	445	5
4-5P	855	395	405	1495	320	615	910	410	5
5-6P	955	360	600	1575	290	670	780	340	5
6-7P	930	255	670	1545	215	610	805	375	5

MD 185	
SB	NB
2195	3810
2430	3950
2430	3945
1995	3770

I-495 North Side PM
Future Alternative No Build Peak Period Volumes



	Exit 29					
	Ramp 1	Ramp 2	Ramp 4	Ramp 5	Ramp 6	Ramp 7
3-4 P	430	430	460	395	790	270
4-5P	595	580	540	470	765	350
5-6P	590	645	675	480	705	480
6-7P	585	550	560	475	515	425

	Exit 30					
	Ramp 1	Ramp 3	Ramp 4	Ramp 6	Ramp 7	Ramp 8
3-4 P	180	1045	880	305	435	820
4-5P	215	1115	1040	260	420	765
5-6P	260	1135	1050	270	405	860
6-7P	290	1240	935	205	455	960

	US 29	
	SB	NB
3-4 P	1920	2615
4-5P	2030	2965
5-6P	2155	3140
6-7P	2015	3180

	MD 193	
	SB	NB
3-4 P	1405	1770
4-5P	1545	1950
5-6P	1595	1690
6-7P	1480	1905

I-495	
EB	WB
9955	7970
9915	8505
8935	8550
7865	7305

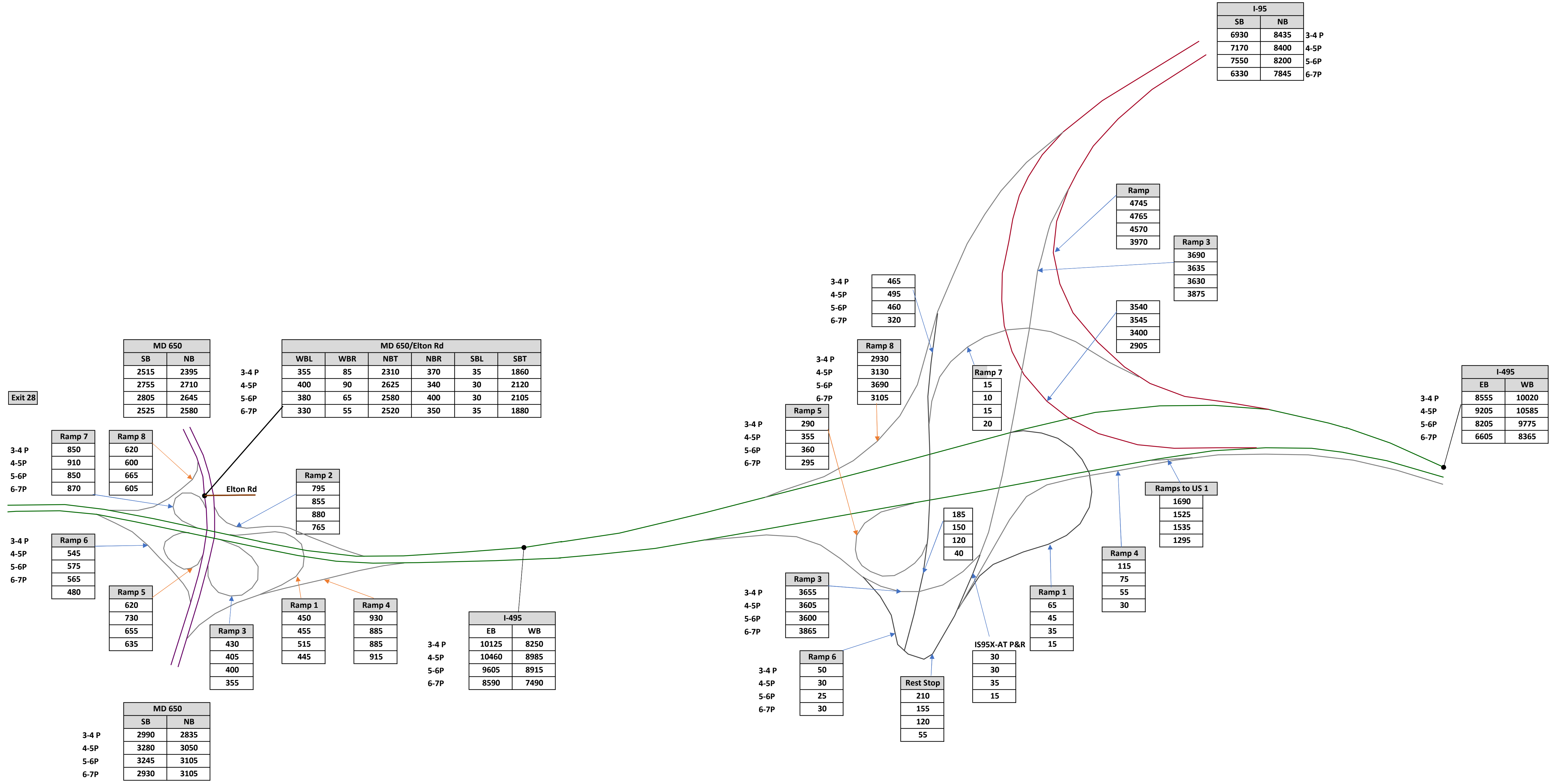
	I-495	
	EB	WB
3-4 P	9545	7675
4-5P	9825	8275
5-6P	9030	8370
6-7P	7880	6900

	US 29	
	SB	NB
3-4 P	1840	2630
4-5P	1940	3110
5-6P	1970	3320
6-7P	1715	3170

I-495	
EB	WB
9480	7405
9580	7940
8580	7835
7355	6510

MD 193	
SB	NB
2065	2230
2190	2505
2295	2305
1940	2500

I-495 North Side PM
Future Alternative No Build Peak Period Volumes



	MD 650	
	SB	NB
3-4 P	2515	2395
4-5P	2755	2710
5-6P	2805	2645
6-7P	2525	2580

	MD 650/Elton Rd					
	WBL	WBR	NBT	NBR	SBL	SBT
3-4 P	355	85	2310	370	35	1860
4-5P	400	90	2625	340	30	2120
5-6P	380	65	2580	400	30	2105
6-7P	330	55	2520	350	35	1880

	Ramp 7	Ramp 8
3-4 P	850	620
4-5P	910	600
5-6P	850	665
6-7P	870	605

Ramp 2
795
855
880
765

	Ramp 6
3-4 P	545
4-5P	575
5-6P	565
6-7P	480

Ramp 5
620
730
655
635

Ramp 3
430
405
400
355

Ramp 1
450
455
515
445

Ramp 4
930
885
885
915

	I-495	
	EB	WB
3-4 P	10125	8250
4-5P	10460	8985
5-6P	9605	8915
6-7P	8590	7490

	MD 650	
	SB	NB
3-4 P	2990	2835
4-5P	3280	3050
5-6P	3245	3105
6-7P	2930	3105

I-95		
SB	NB	
6930	8435	3-4 P
7170	8400	4-5P
7550	8200	5-6P
6330	7845	6-7P

Ramp
4745
4765
4570
3970

Ramp 3
3690
3635
3630
3875

3-4 P	465
4-5P	495
5-6P	460
6-7P	320

3540
3545
3400
2905

	Ramp 8
3-4 P	2930
4-5P	3130
5-6P	3690
6-7P	3105

Ramp 7
15
10
15
20

	Ramp 5
3-4 P	290
4-5P	355
5-6P	360
6-7P	295

	I-495	
	EB	WB
3-4 P	8555	10020
4-5P	9205	10585
5-6P	8205	9775
6-7P	6605	8365

Ramps to US 1
1690
1525
1535
1295

185
150
120
40

Ramp 4
115
75
55
30

	Ramp 3
3-4 P	3655
4-5P	3605
5-6P	3600
6-7P	3865

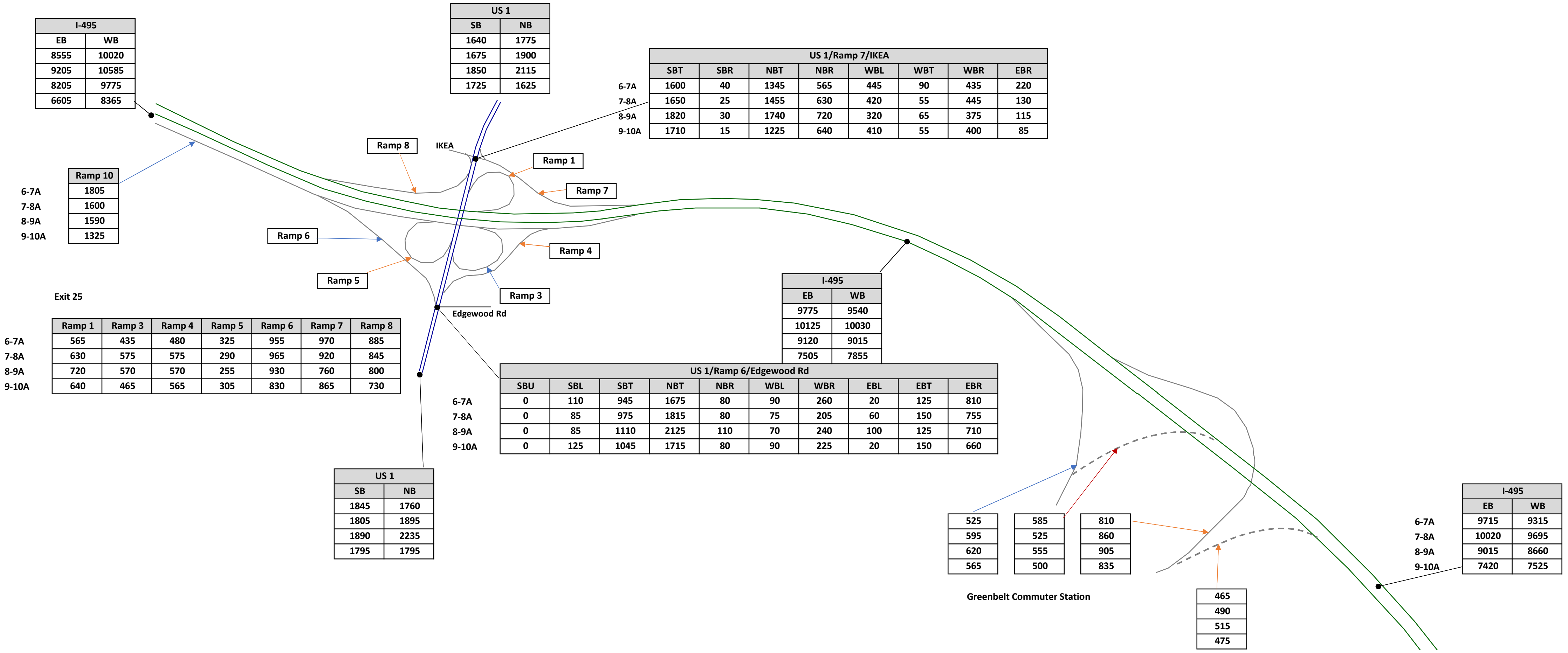
Ramp 1
65
45
35
15

IS95X-AT P&R
30
30
35
15

	Ramp 6
3-4 P	50
4-5P	30
5-6P	25
6-7P	30

Rest Stop
210
155
120
55

I-495 North East Side PM
Future Alternative No Build Peak Period Volumes



I-495	
EB	WB
8555	10020
9205	10585
8205	9775
6605	8365

US 1	
SB	NB
1640	1775
1675	1900
1850	2115
1725	1625

	US 1/Ramp 7/IKEA							
	SBT	SBR	NBT	NBR	WBL	WBT	WBR	EBR
6-7A	1600	40	1345	565	445	90	435	220
7-8A	1650	25	1455	630	420	55	445	130
8-9A	1820	30	1740	720	320	65	375	115
9-10A	1710	15	1225	640	410	55	400	85

	Ramp 10
6-7A	1805
7-8A	1600
8-9A	1590
9-10A	1325

	Ramp 1	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	565	435	480	325	955	970	885
7-8A	630	575	575	290	965	920	845
8-9A	720	570	570	255	930	760	800
9-10A	640	465	565	305	830	865	730

I-495	
EB	WB
9775	9540
10125	10030
9120	9015
7505	7855

	US 1/Ramp 6/Edgewood Rd									
	SBU	SBL	SBT	NBT	NBR	WBL	WBR	EBL	EBT	EBR
6-7A	0	110	945	1675	80	90	260	20	125	810
7-8A	0	85	975	1815	80	75	205	60	150	755
8-9A	0	85	1110	2125	110	70	240	100	125	710
9-10A	0	125	1045	1715	80	90	225	20	150	660

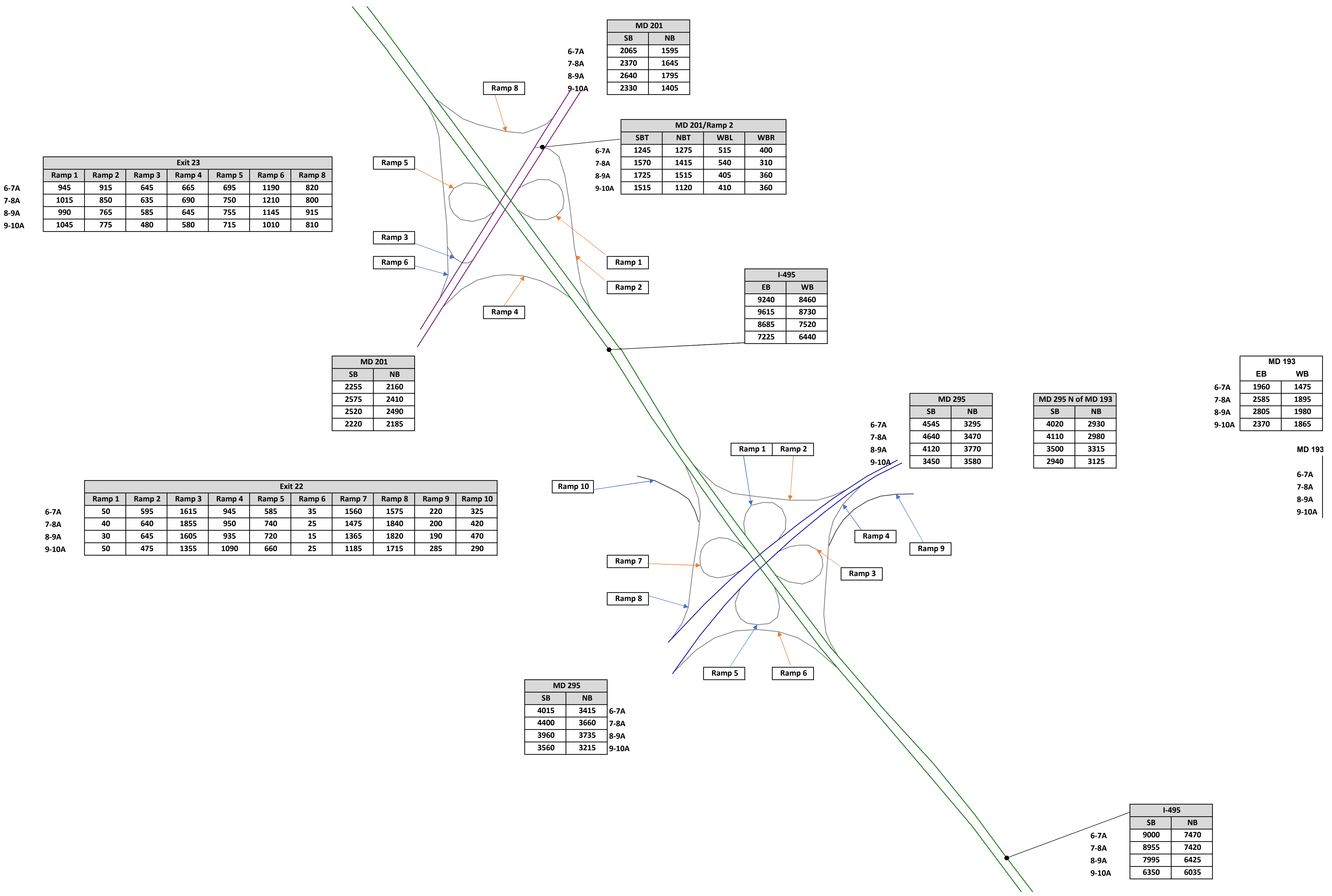
US 1	
SB	NB
1845	1760
1805	1895
1890	2235
1795	1795

525	585	810
595	525	860
620	555	905
565	500	835

465
490
515
475

	I-495	
	EB	WB
6-7A	9715	9315
7-8A	10020	9695
8-9A	9015	8660
9-10A	7420	7525

I-495 North East Side PM
Future Alternative No Build Peak Period Volumes



	MD 201	
	SB	NB
6-7A	2065	1595
7-8A	2370	1645
8-9A	2640	1795
9-10A	2330	1405

	MD 201/Ramp 2			
	SBT	NBT	WBL	WBR
6-7A	1245	1275	515	400
7-8A	1570	1415	540	310
8-9A	1725	1515	405	360
9-10A	1515	1120	410	360

	Exit 23						
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8
6-7A	945	915	645	665	695	1190	820
7-8A	1015	850	635	690	750	1210	800
8-9A	990	765	585	645	755	1145	915
9-10A	1045	775	480	580	715	1010	810

I-495	
EB	WB
9240	8460
9615	8730
8685	7520
7225	6440

MD 201	
SB	NB
2255	2160
2575	2410
2520	2490
2220	2185

	MD 193	
	EB	WB
6-7A	1960	1475
7-8A	2585	1895
8-9A	2805	1980
9-10A	2370	1865

	MD 295	
	SB	NB
6-7A	4545	3295
7-8A	4640	3470
8-9A	4120	3770
9-10A	3450	3580

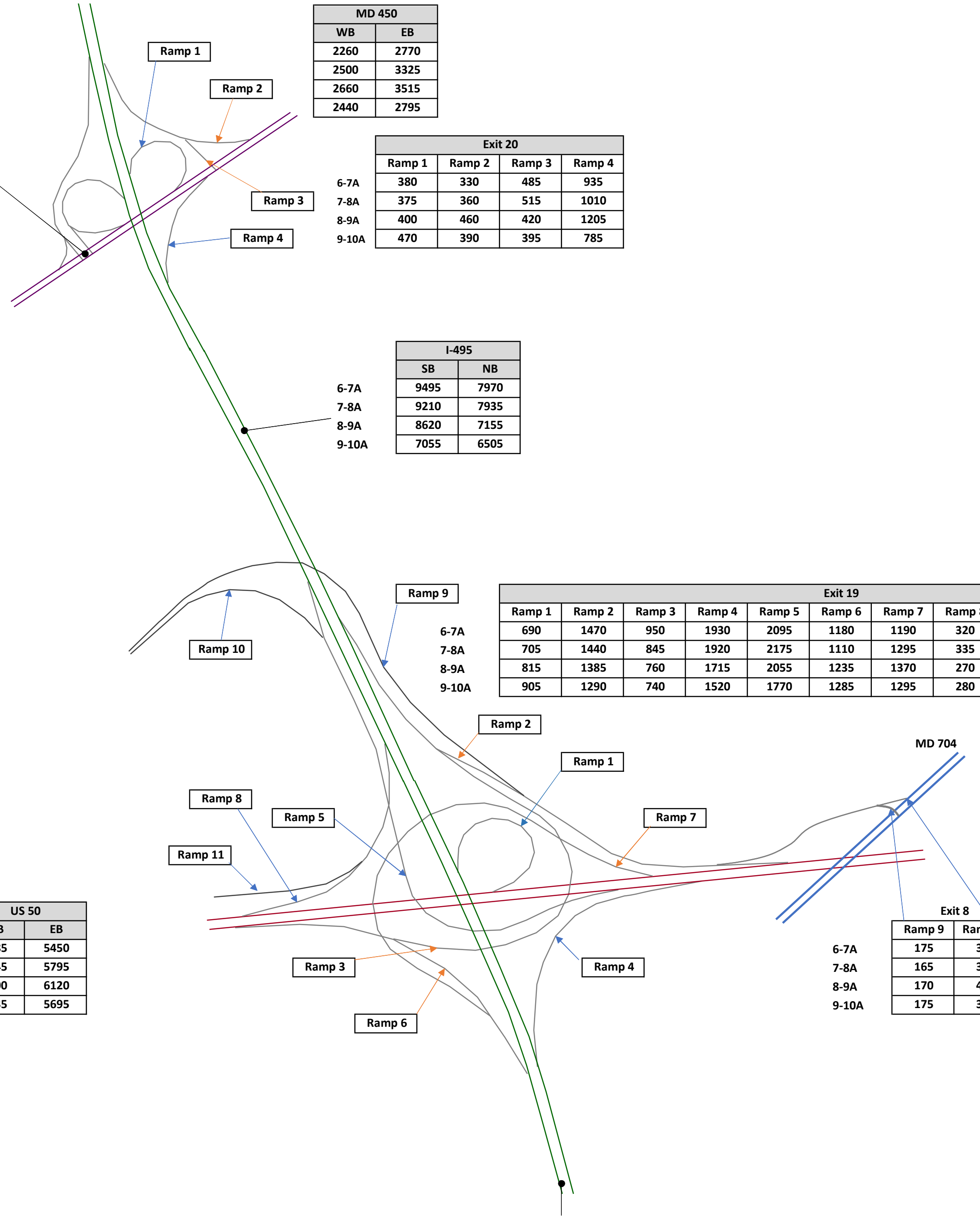
MD 295 N of MD 193	
SB	NB
4020	2930
4110	2980
3500	3315
2940	3125

	Exit 22									
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
6-7A	50	595	1615	945	585	35	1560	1575	220	325
7-8A	40	640	1855	950	740	25	1475	1840	200	420
8-9A	30	645	1605	935	720	15	1365	1820	190	470
9-10A	50	475	1355	1090	660	25	1185	1715	285	290

MD 295		
SB	NB	
4015	3415	6-7A
4400	3660	7-8A
3960	3735	8-9A
3560	3215	9-10A

	I-495	
	SB	NB
6-7A	9000	7470
7-8A	8955	7420
8-9A	7995	6425
9-10A	6350	6035

I-495 North East Side PM
Future Alternative No Build Peak Period Volumes



MD 450	
WB	EB
2260	2770
2500	3325
2660	3515
2440	2795

Exit 20	Ramp 8	Ramp 5	Ramp 6	Ramp 7
6-7A	255	450	530	670
7-8A	210	730	505	695
8-9A	220	385	495	735
9-10A	190	350	530	715

	Exit 20			
	Ramp 1	Ramp 2	Ramp 3	Ramp 4
6-7A	380	330	485	935
7-8A	375	360	515	1010
8-9A	400	460	420	1205
9-10A	470	390	395	785

MD 450	
WB	EB
1895	2395
2035	2600
2090	2840
1995	2580

	I-495	
	SB	NB
6-7A	9495	7970
7-8A	9210	7935
8-9A	8620	7155
9-10A	7055	6505

	Exit 19										
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10	Ramp 11
6-7A	690	1470	950	1930	2095	1180	1190	320	95	90	235
7-8A	705	1440	845	1920	2175	1110	1295	335	205	195	200
8-9A	815	1385	760	1715	2055	1235	1370	270	305	285	235
9-10A	905	1290	740	1520	1770	1285	1295	280	265	250	175

US-50	
WB	EB
3875	7340
4095	7935
4560	7895
4215	6965

	US 50	
	WB	EB
6-7A	2685	5450
7-8A	2745	5795
8-9A	3200	6120
9-10A	3035	5695

	Exit 8	
	Ramp 9	Ramp 10
6-7A	175	380
7-8A	165	395
8-9A	170	445
9-10A	175	310

I-495	
SB	NB
9305	8165
9100	8275
8950	7535
7660	6905

I-495 East Side PM
Future Alternative No Build Peak Period Volumes

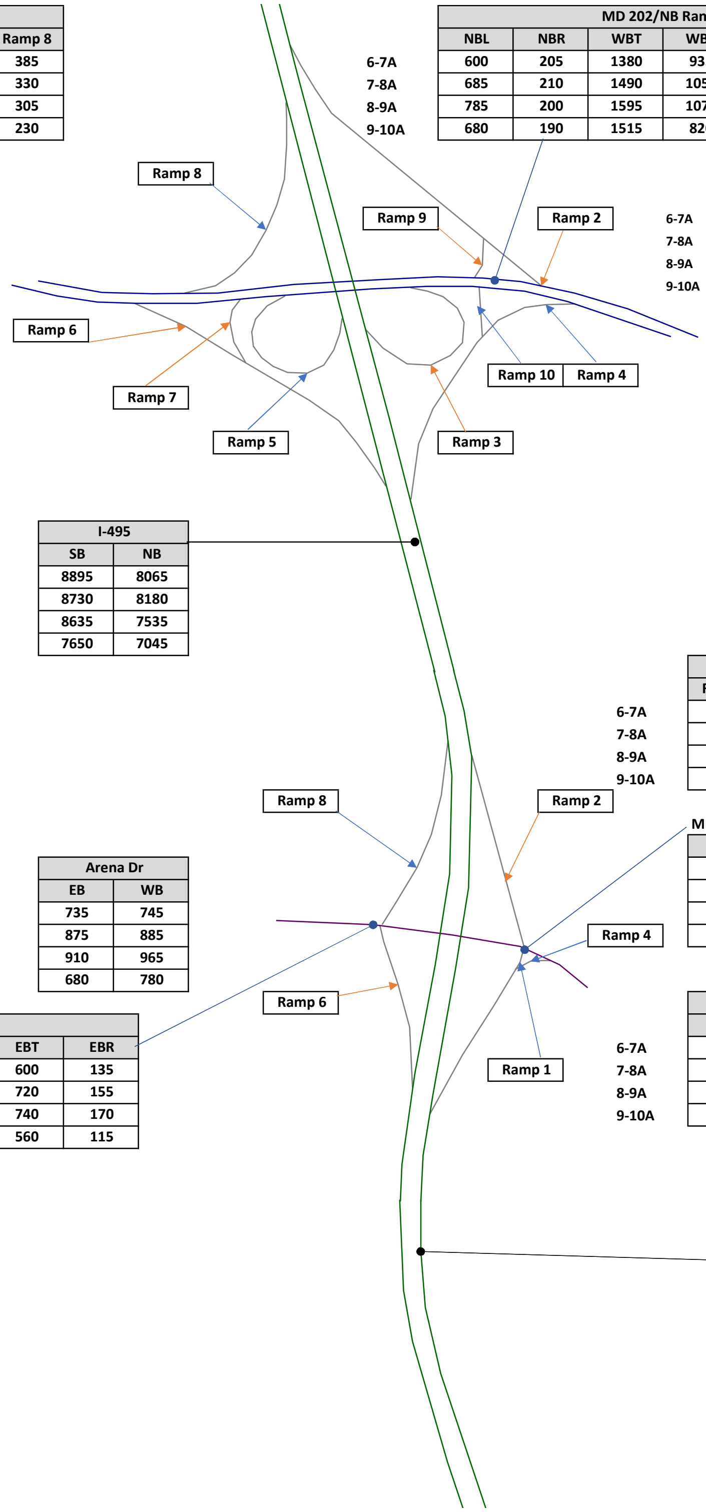
	Exit 17			
	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	840	540	275	385
7-8A	850	560	245	330
8-9A	945	585	355	305
9-10A	715	575	370	230

	MD 202/NB Ramps					
	NBL	NBR	WBT	WBR	EBL	EBT
6-7A	600	205	1380	935	10	2050
7-8A	685	210	1490	1050	10	2320
8-9A	785	200	1595	1070	15	2490
9-10A	680	190	1515	820	10	2240

Ramp 10 TMC	
NBR	NBL
205	600
210	685
200	785
190	680

	Exit 17				
	Ramp 2	Ramp 3	Ramp 4	Ramp 9	Ramp 10
6-7A	935	165	205	10	805
7-8A	1050	145	215	10	900
8-9A	1070	105	205	15	990
9-10A	820	100	195	10	875

	MD 202	
	EB	WB
6-7A	1925	2090
7-8A	2180	2255
8-9A	2250	2330
9-10A	2210	2060



MD 202	
SB	NB
2460	2315
2750	2540
2895	2665
2625	2335

I-495	
SB	NB
8895	8065
8730	8180
8635	7535
7650	7045

	Exit 16				
	Ramp 1	Ramp 2	Ramp 4	Ramp 6	Ramp 8
6-7A	130	475	215	375	485
7-8A	140	495	220	380	705
8-9A	125	460	245	395	810
9-10A	145	425	200	310	595

MD 214/NB Ramps

NBL	NBT	NBR	WBT	WBR	EBL	EBT
130	0	215	660	220	255	635
140	0	220	700	210	285	870
125	0	245	735	200	260	960
145	0	200	605	160	265	665

Arena Dr	
EB	WB
735	745
875	885
910	965
680	780

	Arena Dr	
	EB	WB
6-7A	845	880
7-8A	1090	910
8-9A	1205	935
9-10A	865	765

	MD 214/SB Ramps						
	SBL	SBT	SBR	WBL	WBT	EBT	EBR
6-7A	290	0	195	240	550	600	135
7-8A	435	0	270	220	620	720	155
8-9A	480	0	330	225	635	740	170
9-10A	370	0	225	195	555	560	115

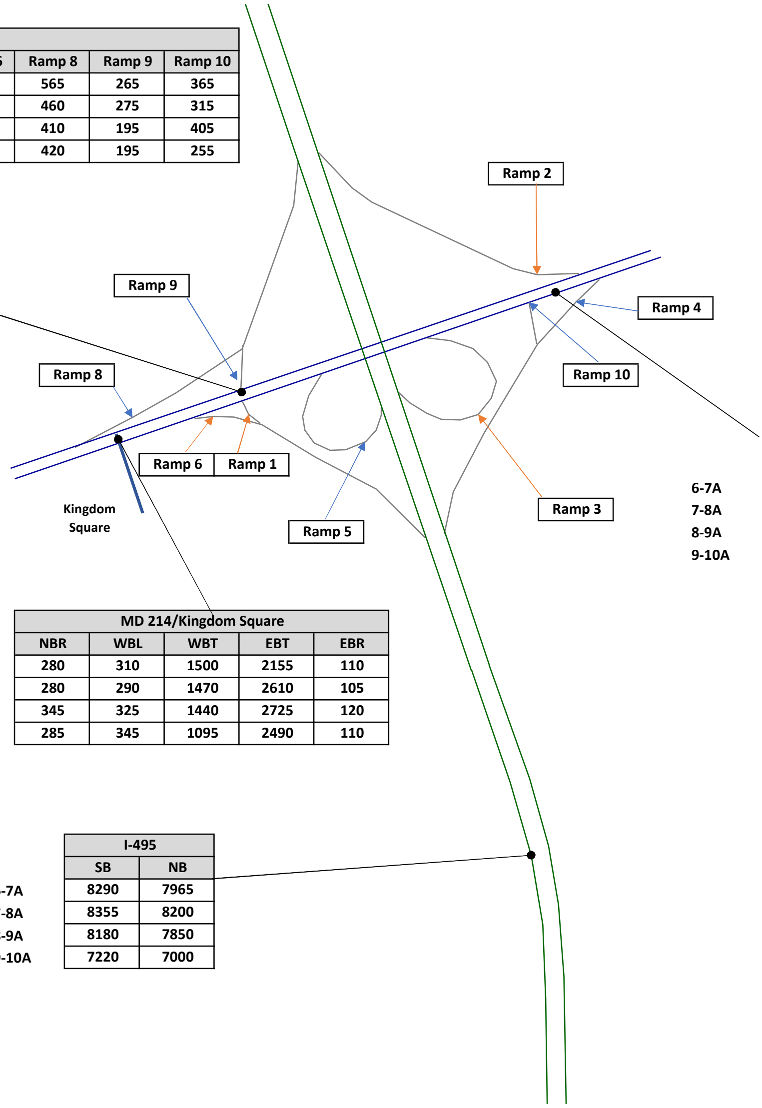
I-495	
SB	NB
8785	7935
8400	8045
8220	7445
7370	6965

I-495 East Side PM
Future Alternative No Build Peak Period Volumes

	Exit 15								
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8	Ramp 9	Ramp 10
6-7A	635	425	1005	1095	565	270	565	265	365
7-8A	880	430	995	1260	600	405	460	275	315
8-9A	840	360	970	1330	645	375	410	195	405
9-10A	835	320	905	1005	750	380	420	195	255

	MD 214	
	EB	WB
6-7A	2825	2240
7-8A	3350	2480
8-9A	3695	2360
9-10A	3250	2145

	MD 214/SB Ramps				
	SBR	WBL	WBT	EBT	EBR
6-7A	265	635	1545	2165	270
7-8A	275	880	1485	2480	405
8-9A	195	840	1565	2690	375
9-10A	195	835	1240	2395	380



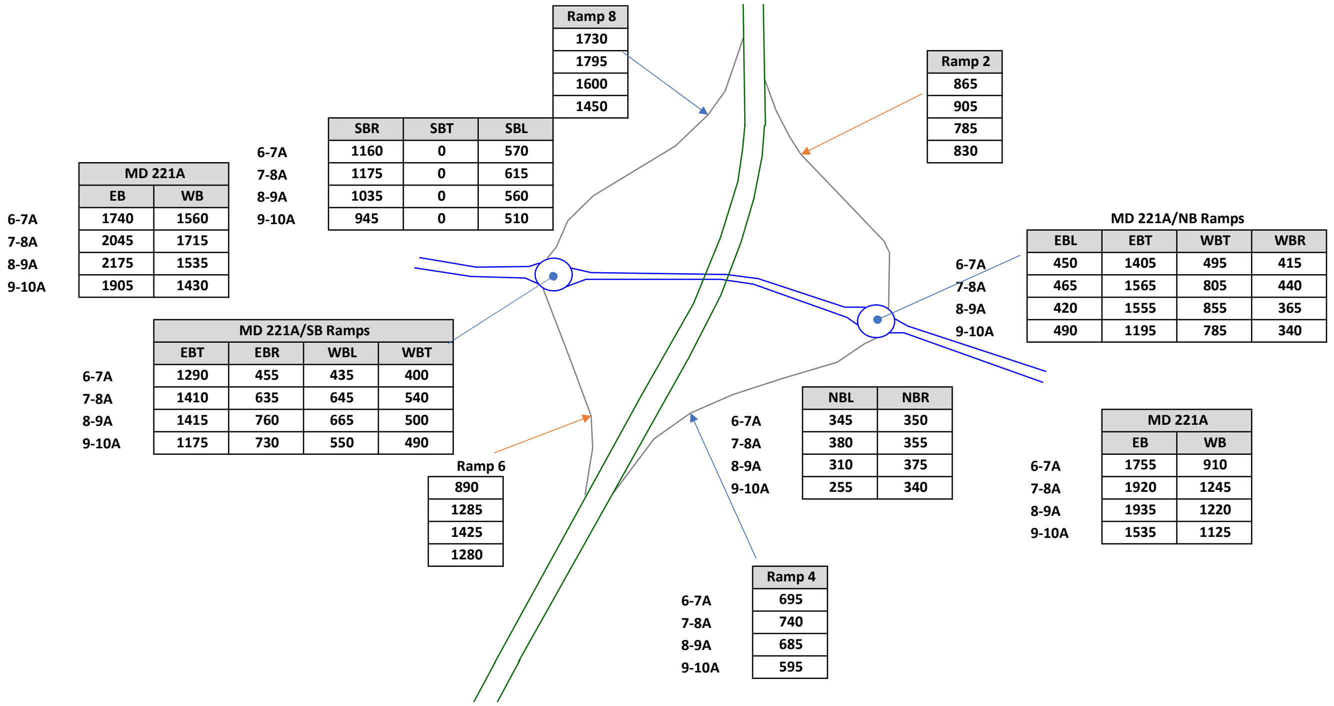
	MD 214/NB Ramps				
	NBL	NBR	WBT	WBR	EBT
6-7A	365	1095	1815	425	1730
7-8A	315	1260	2050	430	2090
8-9A	405	1330	2000	360	2365
9-10A	255	1005	1825	320	2245

	MD 214	
	EB	WB
6-7A	2265	2065
7-8A	2715	1930
8-9A	2845	1845
9-10A	2600	1510

	MD 214/Kingdom Square				
	NBR	WBL	WBT	EBT	EBR
6-7A	280	310	1500	2155	110
7-8A	280	290	1470	2610	105
8-9A	345	325	1440	2725	120
9-10A	285	345	1095	2490	110

	I-495	
	SB	NB
6-7A	8290	7965
7-8A	8355	8200
8-9A	8180	7850
9-10A	7220	7000

I-495 East Side PM
Future Alternative No Build Peak Period Volumes



Ramp 8
1730
1795
1600
1450

	SBR	SBT	SBL
6-7A	1160	0	570
7-8A	1175	0	615
8-9A	1035	0	560
9-10A	945	0	510

Ramp 2
865
905
785
830

	MD 221A	
	EB	WB
6-7A	1740	1560
7-8A	2045	1715
8-9A	2175	1535
9-10A	1905	1430

MD 221A/NB Ramps

	EBL	EBT	WBT	WBR
6-7A	450	1405	495	415
7-8A	465	1565	805	440
8-9A	420	1555	855	365
9-10A	490	1195	785	340

	MD 221A/SB Ramps			
	EBT	EBR	WBL	WBT
6-7A	1290	455	435	400
7-8A	1410	635	645	540
8-9A	1415	760	665	500
9-10A	1175	730	550	490

	NBL	NBR
6-7A	345	350
7-8A	380	355
8-9A	310	375
9-10A	255	340

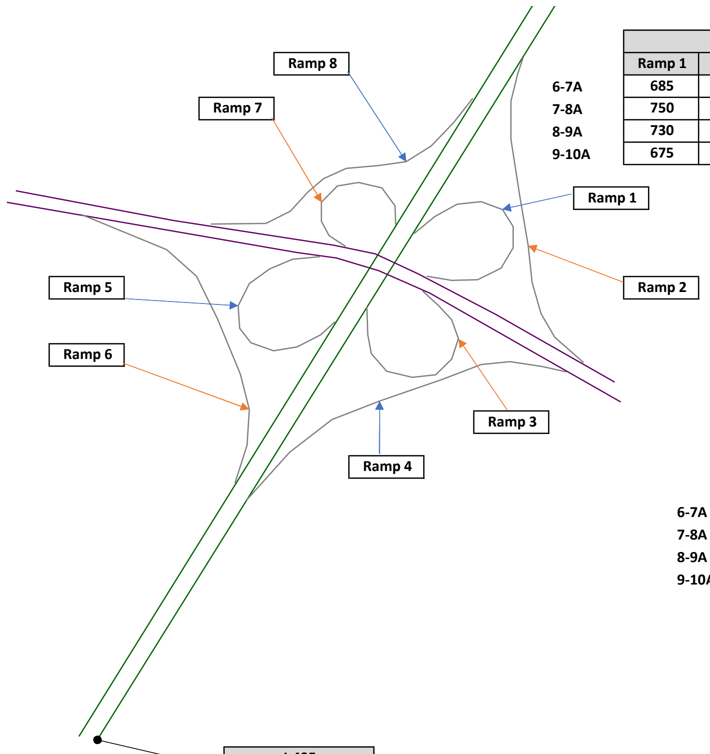
	MD 221A	
	EB	WB
6-7A	1755	910
7-8A	1920	1245
8-9A	1935	1220
9-10A	1535	1125

Ramp 6

890
1285
1425
1280

	Ramp 4
6-7A	695
7-8A	740
8-9A	685
9-10A	595

I-495 East Side PM
Future Alternative No Build Peak Period Volumes



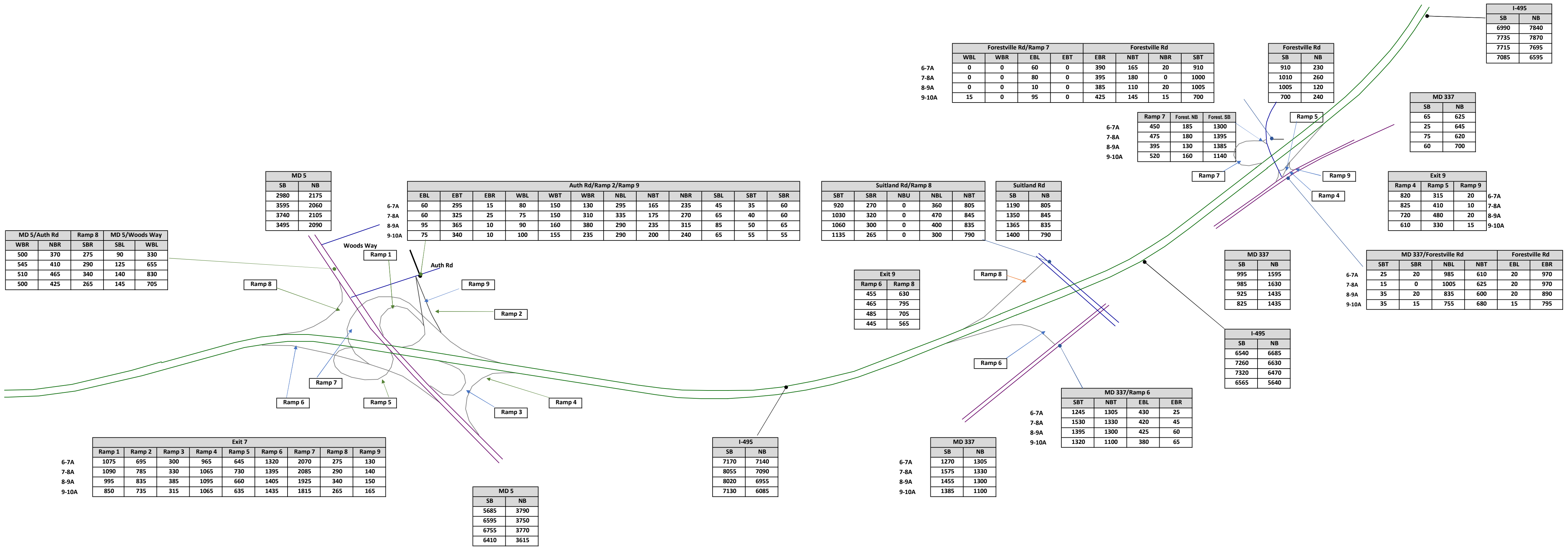
	Exit 11							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	685	1010	770	1145	1020	545	795	785
7-8A	750	1010	830	925	975	780	875	790
8-9A	730	875	810	895	880	650	735	805
9-10A	675	780	870	805	740	820	730	770

	MD 4	
	SB	NB
6-7A	2455	1905
7-8A	2785	2015
8-9A	2885	1940
9-10A	2615	1690

	MD 4	
	SB	NB
6-7A	3305	2240
7-8A	3070	2360
8-9A	3200	2020
9-10A	2470	1745

	I-495	
	SB	NB
6-7A	6990	7840
7-8A	7735	7870
8-9A	7715	7695
9-10A	7085	6595

I-495 South Side PM
Future Alternative No Build Peak Period Volumes



MD 5/Auth Rd		Ramp 8	MD 5/Woods Way	
WBR	NBR	SBR	SBL	WBL
500	370	275	90	330
545	410	290	125	655
510	465	340	140	830
500	425	265	145	705

MD 5	
SB	NB
2980	2175
3595	2060
3740	2105
3495	2090

	Auth Rd/Ramp 2/Ramp 9											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
6-7A	60	295	15	80	150	130	295	165	235	45	35	60
7-8A	60	325	25	75	150	310	335	175	270	65	40	60
8-9A	95	365	10	90	160	380	290	235	315	85	50	65
9-10A	75	340	10	100	155	235	290	200	240	65	55	55

Suitland Rd/Ramp 8				
SBT	SBR	NBU	NBL	NBT
920	270	0	360	805
1030	320	0	470	845
1060	300	0	400	835
1135	265	0	300	790

Suitland Rd	
SB	NB
1190	805
1350	845
1365	835
1400	790

Exit 9	
Ramp 6	Ramp 8
455	630
465	795
485	705
445	565

	Forestville Rd/Ramp 7				Forestville Rd			
	WBL	WBR	EBL	EBT	EBR	NBT	NBR	SBT
6-7A	0	0	60	0	390	165	20	910
7-8A	0	0	80	0	395	180	0	1000
8-9A	0	0	10	0	385	110	20	1005
9-10A	15	0	95	0	425	145	15	700

Forestville Rd	
SB	NB
910	230
1010	260
1005	120
700	240

I-495	
SB	NB
6990	7840
7735	7870
7715	7695
7085	6595

	Ramp 7	Forest. NB	Forest. SB
6-7A	450	185	1300
7-8A	475	180	1395
8-9A	395	130	1385
9-10A	520	160	1140

MD 337	
SB	NB
65	625
25	645
75	620
60	700

Exit 9			
Ramp 4	Ramp 5	Ramp 9	
820	315	20	6-7A
825	410	10	7-8A
720	480	20	8-9A
610	330	15	9-10A

MD 337	
SB	NB
995	1595
985	1630
925	1435
825	1435

	MD 337/Forestville Rd				Forestville Rd	
	SBT	SBR	NBL	NBT	EBL	EBR
6-7A	25	20	985	610	20	970
7-8A	15	0	1005	625	20	970
8-9A	35	20	835	600	20	890
9-10A	35	15	755	680	15	795

I-495	
SB	NB
6540	6685
7260	6630
7320	6470
6565	5640

	MD 337/Ramp 6			
	SBT	NBT	EBL	EBR
6-7A	1245	1305	430	25
7-8A	1530	1330	420	45
8-9A	1395	1300	425	60
9-10A	1320	1100	380	65

	Exit 7								
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9
6-7A	1075	695	300	965	645	1320	2070	275	130
7-8A	1090	785	330	1065	730	1395	2085	290	140
8-9A	995	835	385	1095	660	1405	1925	340	150
9-10A	850	735	315	1065	635	1435	1815	265	165

MD 5	
SB	NB
5685	3790
6595	3750
6755	3770
6410	3615

I-495	
SB	NB
7170	7140
8055	7090
8020	6955
7130	6085

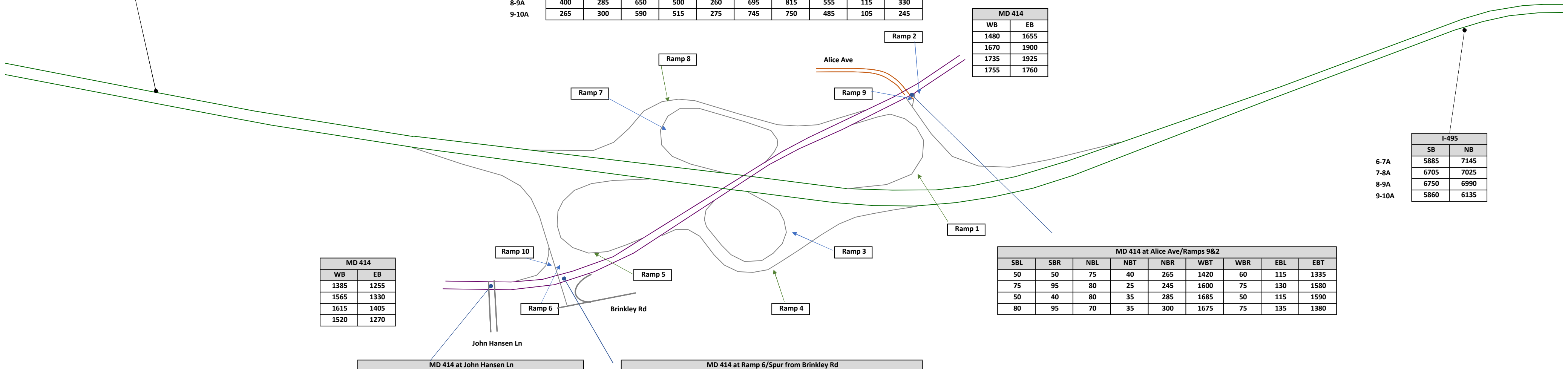
	MD 337	
	SB	NB
6-7A	1270	1305
7-8A	1575	1330
8-9A	1455	1300
9-10A	1385	1100

I-495 South Side PM
Future Alternative No Build Peak Period Volumes

I-495	
SB	NB
5570	7720
6425	7950
6485	7900
5455	6925

	Exit 4									
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
6-7A	415	265	495	510	245	640	825	470	115	200
7-8A	355	245	645	485	235	780	785	510	105	220
8-9A	400	285	650	500	260	695	815	555	115	330
9-10A	265	300	590	515	275	745	750	485	105	245

MD 414	
WB	EB
1480	1655
1670	1900
1735	1925
1755	1760



	I-495	
	SB	NB
6-7A	5885	7145
7-8A	6705	7025
8-9A	6750	6990
9-10A	5860	6135

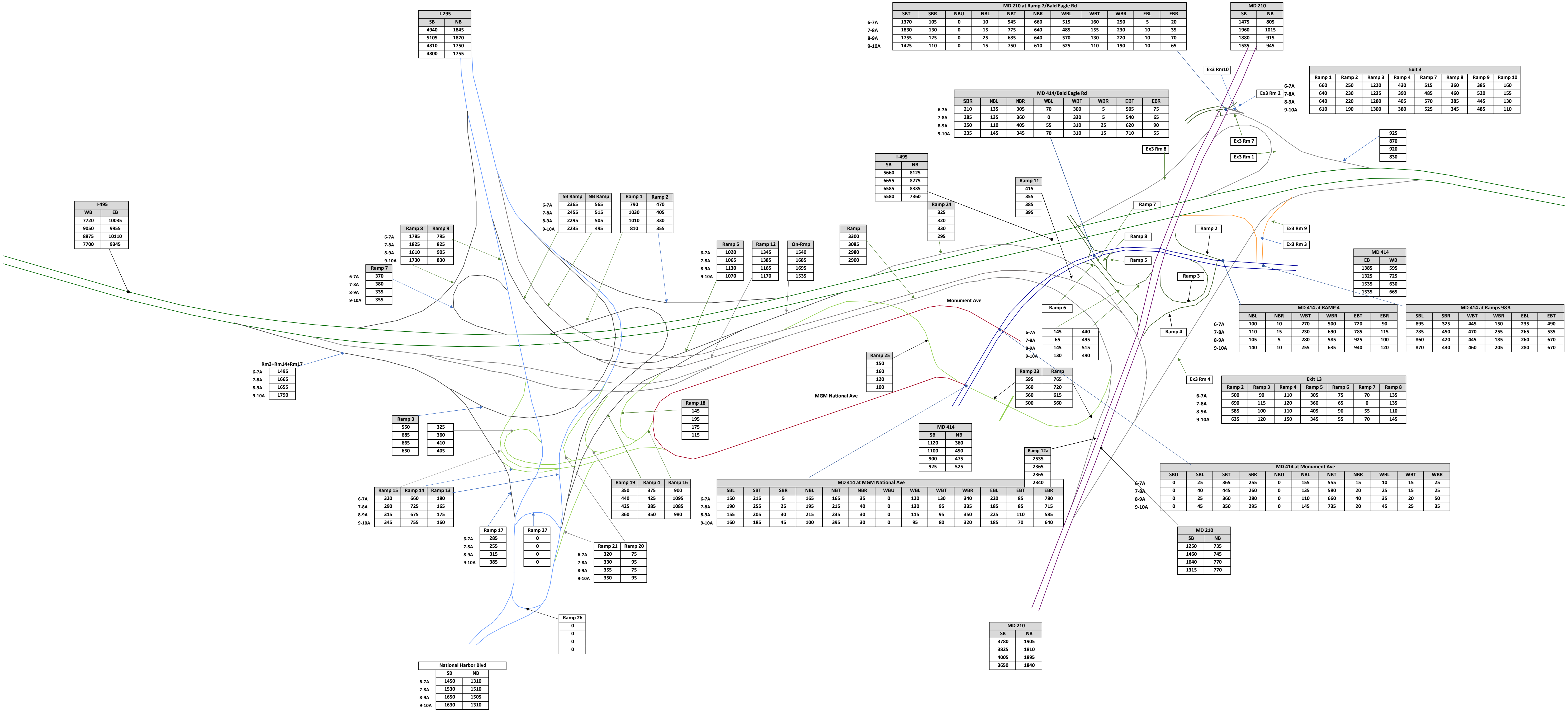
MD 414 at Alice Ave/Ramps 9&2								
SBL	SBR	NBL	NBT	NBR	WBT	WBR	EBL	EBT
50	50	75	40	265	1420	60	115	1335
75	95	80	25	245	1600	75	130	1580
50	40	80	35	285	1685	50	115	1590
80	95	70	35	300	1675	75	135	1380

MD 414	
WB	EB
1385	1255
1565	1330
1615	1405
1520	1270

MD 414 at John Hansen Ln					
NBL	NBR	WBL	WBT	EBT	EBR
230	210	430	1155	985	265
225	245	460	1340	970	360
210	250	465	1410	1020	385
230	265	480	1290	925	345

MD 414 at Ramp 6/Spur from Brinkley Rd							
SBL	SBT	SBR	NBR	WBL	WBT	EBT	EBR
35	605	200	660	270	1385	1190	10
50	730	220	660	240	1575	1190	20
35	660	330	655	265	1545	1265	10
35	710	245	495	310	1525	1170	15

I-495 South Side PM
Future Alternative No Build Peak Period Volumes



I-495	
WB	EB
7720	10035
9050	9955
8875	10110
7700	9345

I-295	
SB	NB
4940	1845
5105	1870
4810	1750
4800	1755

	Ramp 8	Ramp 9
6-7A	1785	795
7-8A	1825	825
8-9A	1610	905
9-10A	1730	830

	Ramp 7
6-7A	370
7-8A	380
8-9A	335
9-10A	355

	SB Ramp	NB Ramp
6-7A	2365	565
7-8A	2455	515
8-9A	2295	505
9-10A	2235	495

Ramp 1	Ramp 2
790	470
1030	405
1010	330
810	355

	Ramp 5
6-7A	1020
7-8A	1065
8-9A	1130
9-10A	1070

Ramp 12
1345
1385
1165
1170

On-Rmp
1540
1685
1695
1535

Ramp
3300
3085
2980
2900

I-495	
SB	NB
5660	8125
6655	8275
6585	8335
5580	7360

Ramp 24
325
320
330
295

Ramp 11
415
355
385
395

	MD 210 at Ramp 7/Bald Eagle Rd										
	SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBR
6-7A	1370	105	0	10	545	660	515	160	250	5	20
7-8A	1830	130	0	15	775	640	485	155	230	10	35
8-9A	1755	125	0	25	685	640	570	130	220	10	70
9-10A	1425	110	0	15	750	610	525	110	190	10	65

MD 210	
SB	NB
1475	805
1960	1015
1880	915
1535	945

	MD 414/Bald Eagle Rd							
	SBR	NBL	NBR	WBL	WBT	WBR	EBT	EBR
6-7A	210	135	305	70	300	5	505	75
7-8A	285	135	360	0	330	5	540	65
8-9A	250	110	405	55	310	25	620	90
9-10A	235	145	345	70	310	15	710	55

	Exit 3							
	Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 7	Ramp 8	Ramp 9	Ramp 10
6-7A	660	250	1220	430	515	360	385	160
7-8A	640	230	1235	390	485	460	520	155
8-9A	640	220	1280	405	570	385	445	130
9-10A	610	190	1300	380	525	345	485	110

925
870
920
830

MD 414	
EB	WB
1385	595
1325	725
1535	630
1535	665

	MD 414 at RAMP 4					
	NBL	NBR	WBT	WBR	EBT	EBR
6-7A	100	10	270	500	720	90
7-8A	110	15	230	690	785	115
8-9A	105	5	280	585	925	100
9-10A	140	10	255	635	940	120

MD 414 at Ramps 9&3					
SBL	SBR	WBT	WBR	EBL	EBT
895	325	445	150	235	490
785	450	470	255	265	535
860	420	445	185	260	670
870	430	460	205	280	670

6-7A	145	440
7-8A	65	495
8-9A	145	515
9-10A	130	490

Ramp 23	Ramp
595	765
560	720
560	615
500	560

	Exit 13						
	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
6-7A	500	90	110	305	75	70	135
7-8A	690	115	120	360	65	0	135
8-9A	585	100	110	405	90	55	110
9-10A	635	120	150	345	55	70	145

	Rm3+Rm14+Rm17
6-7A	1495
7-8A	1665
8-9A	1655
9-10A	1790

Ramp 3	
550	325
685	360
665	410
650	405

Ramp 25
150
160
120
100

Ramp 18
145
195
175
115

MD 414	
SB	NB
1120	360
1100	450
900	475
925	525

Ramp 12a
2535
2365
2365
2340

	MD 414 at Monument Ave										
	SBU	SBL	SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR
6-7A	0	25	365	255	0	155	555	15	10	15	25
7-8A	0	40	445	260	0	135	580	20	25	15	25
8-9A	0	25	360	280	0	110	660	40	35	20	50
9-10A	0	45	350	295	0	145	735	20	45	25	35

	Ramp 15	Ramp 14	Ramp 13
6-7A	320	660	180
7-8A	290	725	165
8-9A	315	675	175
9-10A	345	755	160

Ramp 19	Ramp 4	Ramp 16
350	375	900
440	425	1095
425	385	1085
360	350	980

	MD 414 at MGM National Ave												
	SBL	SBT	SBR	NBL	NBT	NBR	WBU	WBL	WBT	WBR	EBL	EBT	EBR
6-7A	150	215	5	165	165	35	0	120	130	340	220	85	780
7-8A	190	255	25	195	215	40	0	130	95	335	185	85	715
8-9A	155	205	30	215	235	30	0	115	95	350	225	110	585
9-10A	160	185	45	100	395	30	0	95	80	320	185	70	640

MD 210	
SB	NB
1250	735
1460	745
1640	770
1315	770

	Ramp 17
6-7A	285
7-8A	255
8-9A	315
9-10A	385

Ramp 27
0
0
0
0

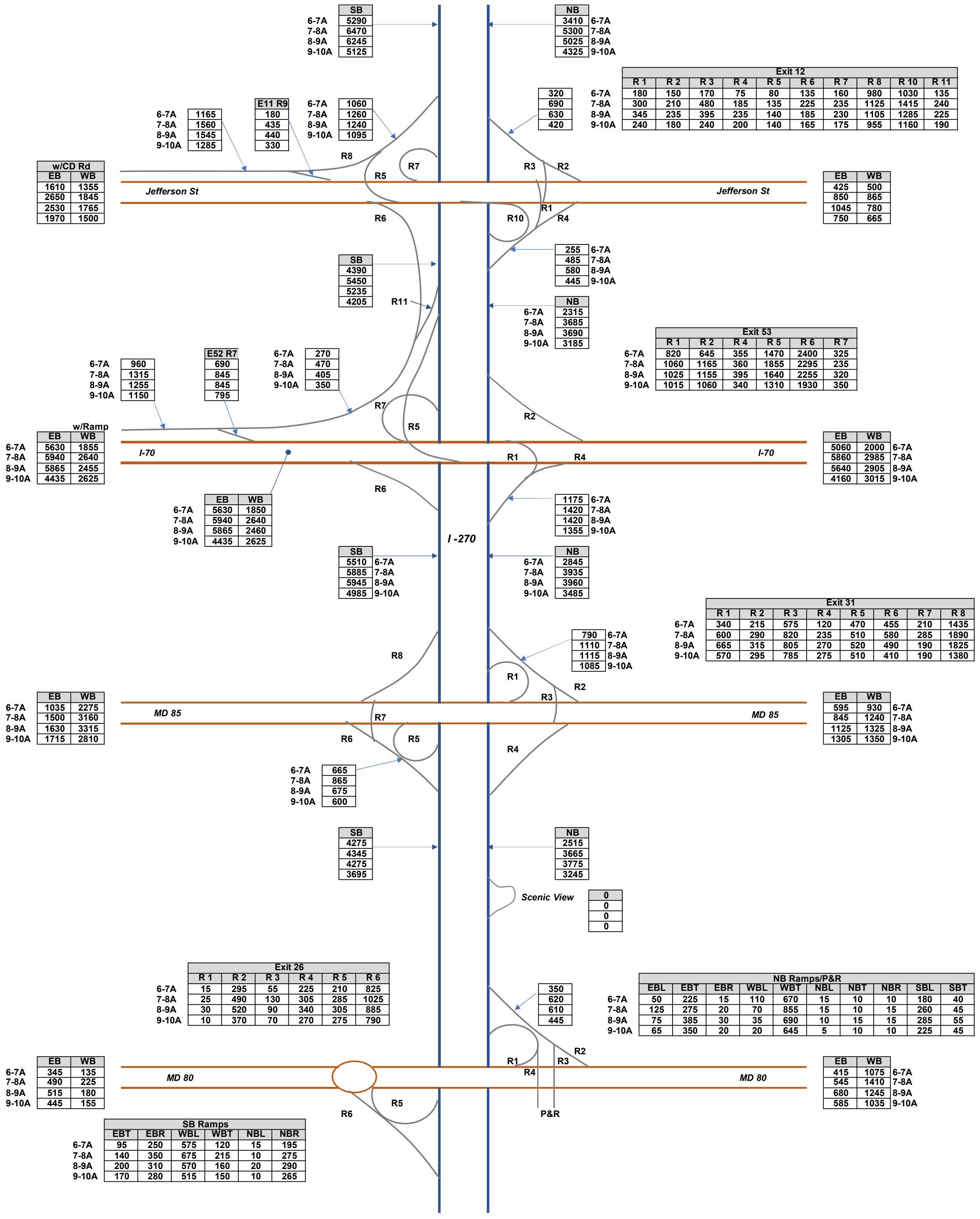
	Ramp 21	Ramp 20
6-7A	320	75
7-8A	330	95
8-9A	355	75
9-10A	350	95

Ramp 26
0
0
0
0

MD 210	
SB	NB
3780	1905
3825	1810
4005	1895
3650	1840

	National Harbor Blvd	
	SB	NB
6-7A	1450	1310
7-8A	1530	1510
8-9A	1650	1505
9-10A	1630	1310

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



Exit 12	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 10	R 11
6-7A	180	150	170	75	80	135	160	980	1030	135
7-8A	300	210	480	185	135	225	235	1125	1415	240
8-9A	345	235	395	235	140	185	230	1105	1285	225
9-10A	240	180	240	200	140	165	175	955	1160	190

Exit 53	R 1	R 2	R 4	R 5	R 6	R 7
6-7A	820	645	355	1470	2400	325
7-8A	1060	1165	360	1855	2295	235
8-9A	1025	1155	395	1640	2255	320
9-10A	1015	1060	340	1310	1930	350

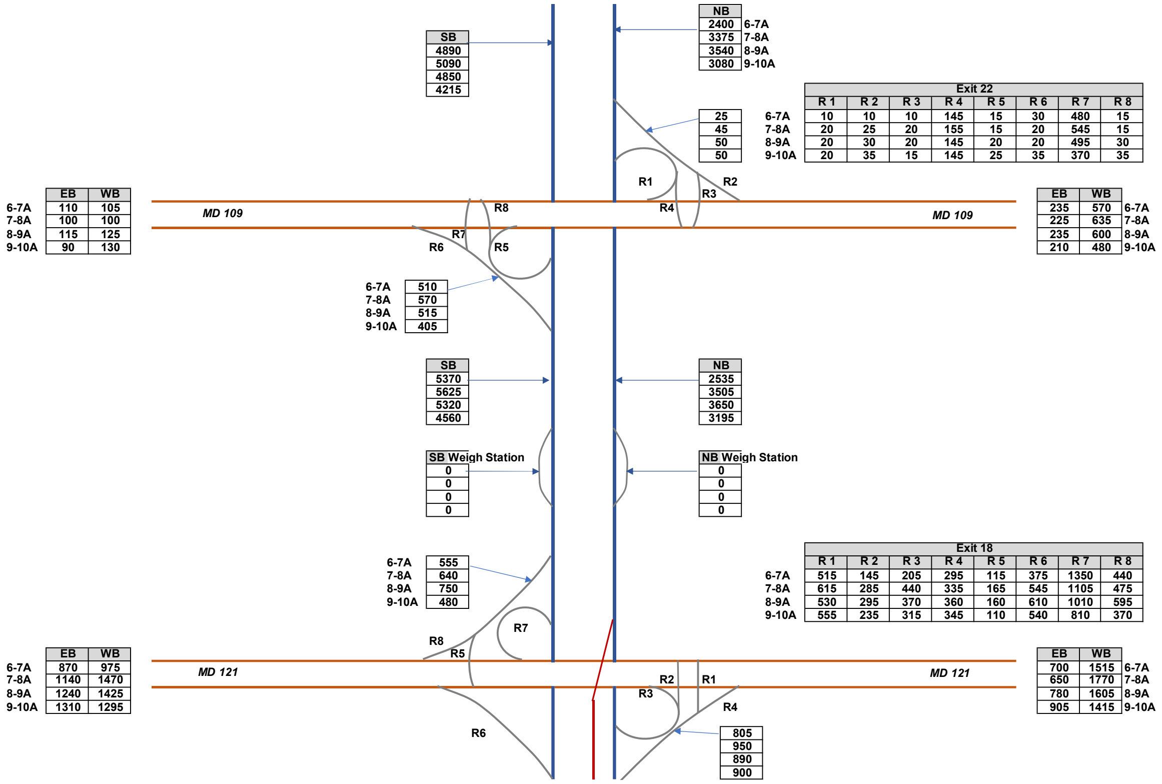
Exit 31	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	340	215	575	120	470	455	210	1435
7-8A	600	290	820	235	510	580	285	1890
8-9A	665	315	805	270	520	490	190	1825
9-10A	570	295	785	275	510	410	190	1380

Exit 26	R 1	R 2	R 3	R 4	R 5	R 6
6-7A	15	295	55	225	210	825
7-8A	25	490	130	305	285	1025
8-9A	30	520	90	340	305	885
9-10A	10	370	70	270	275	790

NB Ramps/P&R	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
6-7A	50	225	15	110	670	15	10	10	180	40
7-8A	125	275	20	70	855	15	10	15	260	45
8-9A	75	385	30	35	690	10	15	15	285	55
9-10A	65	350	20	20	645	5	10	10	225	45

SB Ramps	EBT	EBR	WBL	WBT	NBL	NBR
6-7A	95	250	575	120	15	195
7-8A	140	350	675	215	10	275
8-9A	200	310	570	160	20	290
9-10A	170	280	515	150	10	265

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



SB
4890
5090
4850
4215

NB	
2400	6-7A
3375	7-8A
3540	8-9A
3080	9-10A

25	6-7A
45	7-8A
50	8-9A
50	9-10A

	Exit 22							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	10	10	10	145	15	30	480	15
7-8A	20	25	20	155	15	20	545	15
8-9A	20	30	20	145	20	20	495	30
9-10A	20	35	15	145	25	35	370	35

	EB	WB
6-7A	110	105
7-8A	100	100
8-9A	115	125
9-10A	90	130

EB	WB	
235	570	6-7A
225	635	7-8A
235	600	8-9A
210	480	9-10A

6-7A	510
7-8A	570
8-9A	515
9-10A	405

SB
5370
5625
5320
4560

NB
2535
3505
3650
3195

SB Weigh Station
0
0
0
0

NB Weigh Station
0
0
0
0

6-7A	555
7-8A	640
8-9A	750
9-10A	480

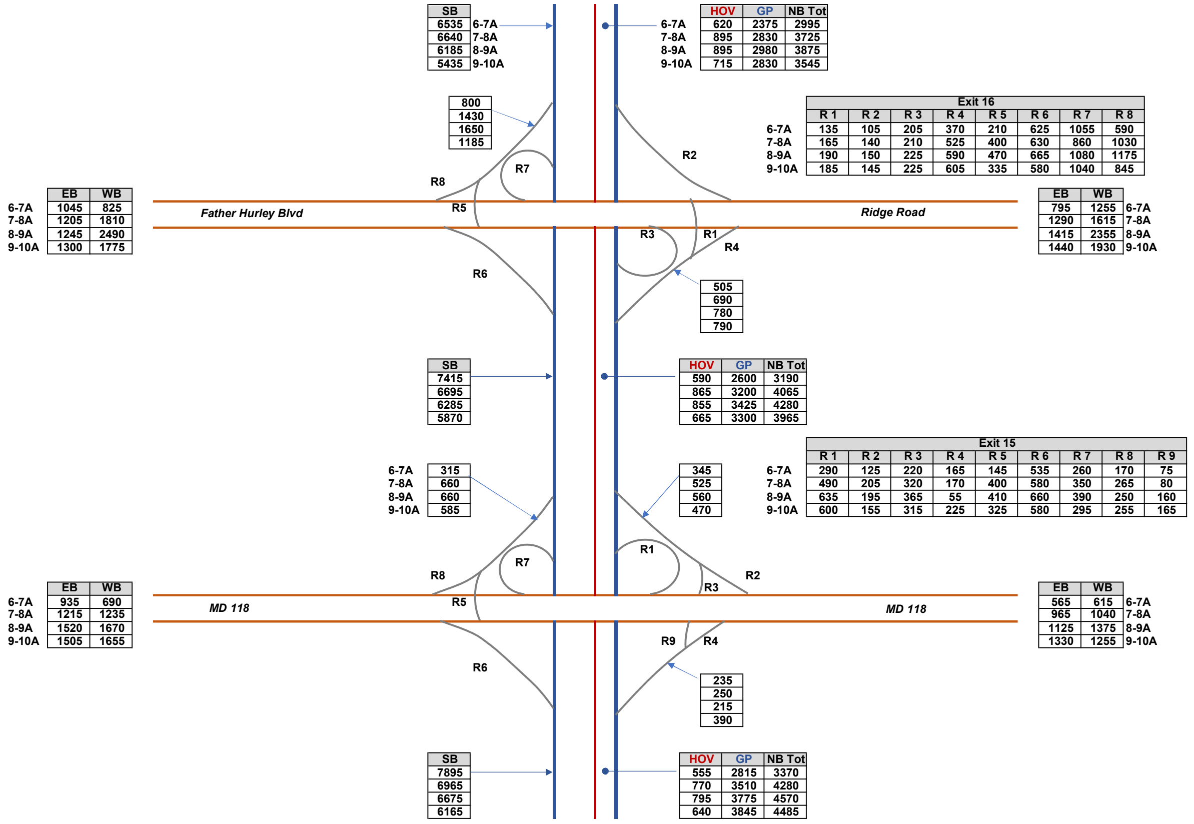
	Exit 18							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	515	145	205	295	115	375	1350	440
7-8A	615	285	440	335	165	545	1105	475
8-9A	530	295	370	360	160	610	1010	595
9-10A	555	235	315	345	110	540	810	370

	EB	WB
6-7A	870	975
7-8A	1140	1470
8-9A	1240	1425
9-10A	1310	1295

EB	WB	
700	1515	6-7A
650	1770	7-8A
780	1605	8-9A
905	1415	9-10A

805
950
890
900

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



	SB
6-7A	6535
7-8A	6640
8-9A	6185
9-10A	5435

	HOV	GP	NB Tot
6-7A	620	2375	2995
7-8A	895	2830	3725
8-9A	895	2980	3875
9-10A	715	2830	3545

800
1430
1650
1185

	Exit 16							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
6-7A	135	105	205	370	210	625	1055	590
7-8A	165	140	210	525	400	630	860	1030
8-9A	190	150	225	590	470	665	1080	1175
9-10A	185	145	225	605	335	580	1040	845

	EB	WB
6-7A	1045	825
7-8A	1205	1810
8-9A	1245	2490
9-10A	1300	1775

EB	WB	
795	1255	6-7A
1290	1615	7-8A
1415	2355	8-9A
1440	1930	9-10A

505
690
780
790

SB
7415
6695
6285
5870

HOV	GP	NB Tot
590	2600	3190
865	3200	4065
855	3425	4280
665	3300	3965

	Exit 15								
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9
6-7A	290	125	220	165	145	535	260	170	75
7-8A	490	205	320	170	400	580	350	265	80
8-9A	635	195	365	55	410	660	390	250	160
9-10A	600	155	315	225	325	580	295	255	165

6-7A	315
7-8A	660
8-9A	660
9-10A	585

345
525
560
470

	EB	WB
6-7A	935	690
7-8A	1215	1235
8-9A	1520	1670
9-10A	1505	1655

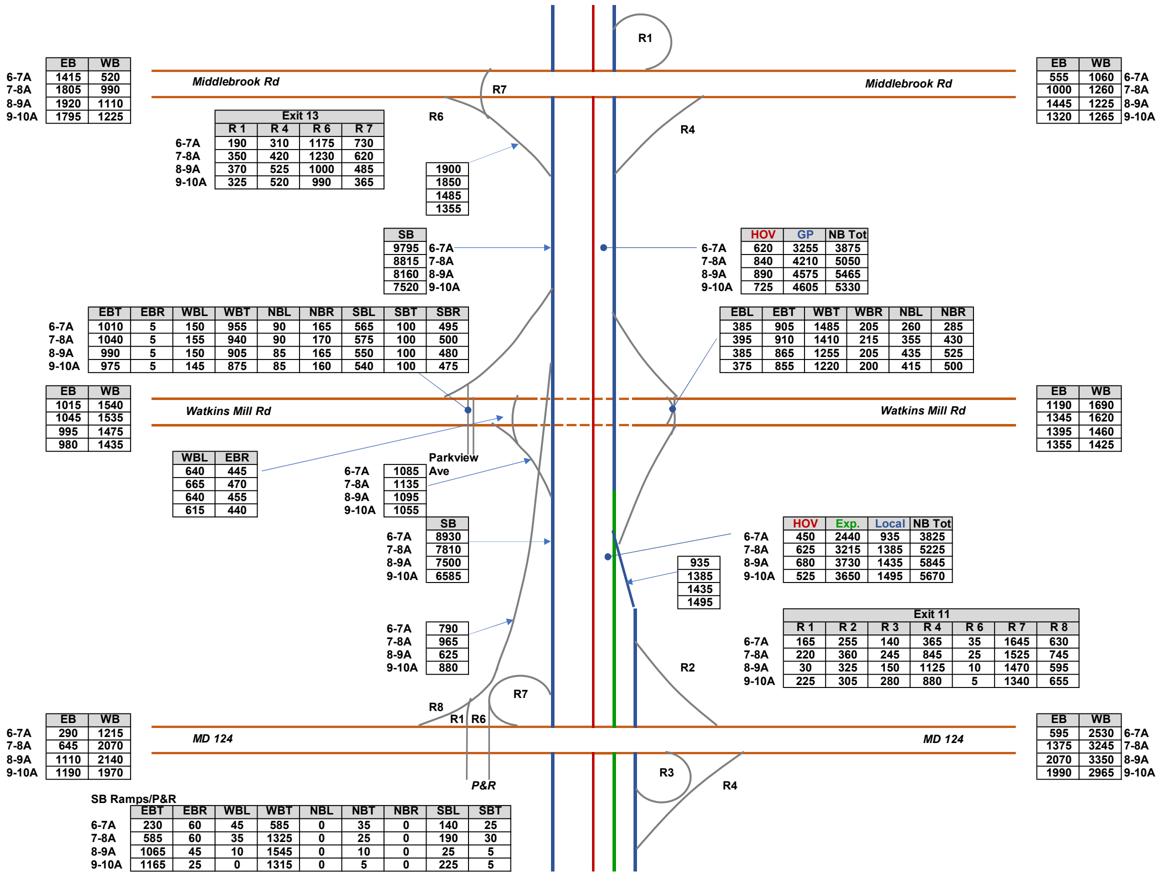
EB	WB	
565	615	6-7A
965	1040	7-8A
1125	1375	8-9A
1330	1255	9-10A

235
250
215
390

SB
7895
6965
6675
6165

HOV	GP	NB Tot
555	2815	3370
770	3510	4280
795	3775	4570
640	3845	4485

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



Middlebrook Rd (west)

	EB	WB
6-7A	1415	520
7-8A	1805	990
8-9A	1920	1110
9-10A	1795	1225

Middlebrook Rd (east)

EB	WB	
555	1060	6-7A
1000	1260	7-8A
1445	1225	8-9A
1320	1265	9-10A

Exit 13

	R 1	R 4	R 6	R 7
6-7A	190	310	1175	730
7-8A	350	420	1230	620
8-9A	370	525	1000	485
9-10A	325	520	990	365

1900
1850
1485
1355

SB	
9795	6-7A
8815	7-8A
8160	8-9A
7520	9-10A

	HOV	GP	NB Tot
6-7A	620	3255	3875
7-8A	840	4210	5050
8-9A	890	4575	5465
9-10A	725	4605	5330

	EBT	EBR	WBL	WBT	NBL	NBR	SBL	SBT	SBR
6-7A	1010	5	150	955	90	165	565	100	495
7-8A	1040	5	155	940	90	170	575	100	500
8-9A	990	5	150	905	85	165	550	100	480
9-10A	975	5	145	875	85	160	540	100	475

EBL	EBT	WBT	WBR	NBL	NBR
385	905	1485	205	260	285
395	910	1410	215	355	430
385	865	1255	205	435	525
375	855	1220	200	415	500

Watkins Mill Rd (west)

EB	WB
1015	1540
1045	1535
995	1475
980	1435

Watkins Mill Rd (east)

EB	WB
1190	1690
1345	1620
1395	1460
1355	1425

WBL	EBR
640	445
665	470
640	455
615	440

Parkview Ave

6-7A	1085
7-8A	1135
8-9A	1095
9-10A	1055

	SB
6-7A	8930
7-8A	7810
8-9A	7500
9-10A	6585

	HOV	Exp.	Local	NB Tot
6-7A	450	2440	935	3825
7-8A	625	3215	1385	5225
8-9A	680	3730	1435	5845
9-10A	525	3650	1495	5670

935
1385
1435
1495

6-7A	790
7-8A	965
8-9A	625
9-10A	880

Exit 11

	R 1	R 2	R 3	R 4	R 6	R 7	R 8
6-7A	165	255	140	365	35	1645	630
7-8A	220	360	245	845	25	1525	745
8-9A	30	325	150	1125	10	1470	595
9-10A	225	305	280	880	5	1340	655

MD 124 (west)

	EB	WB
6-7A	290	1215
7-8A	645	2070
8-9A	1110	2140
9-10A	1190	1970

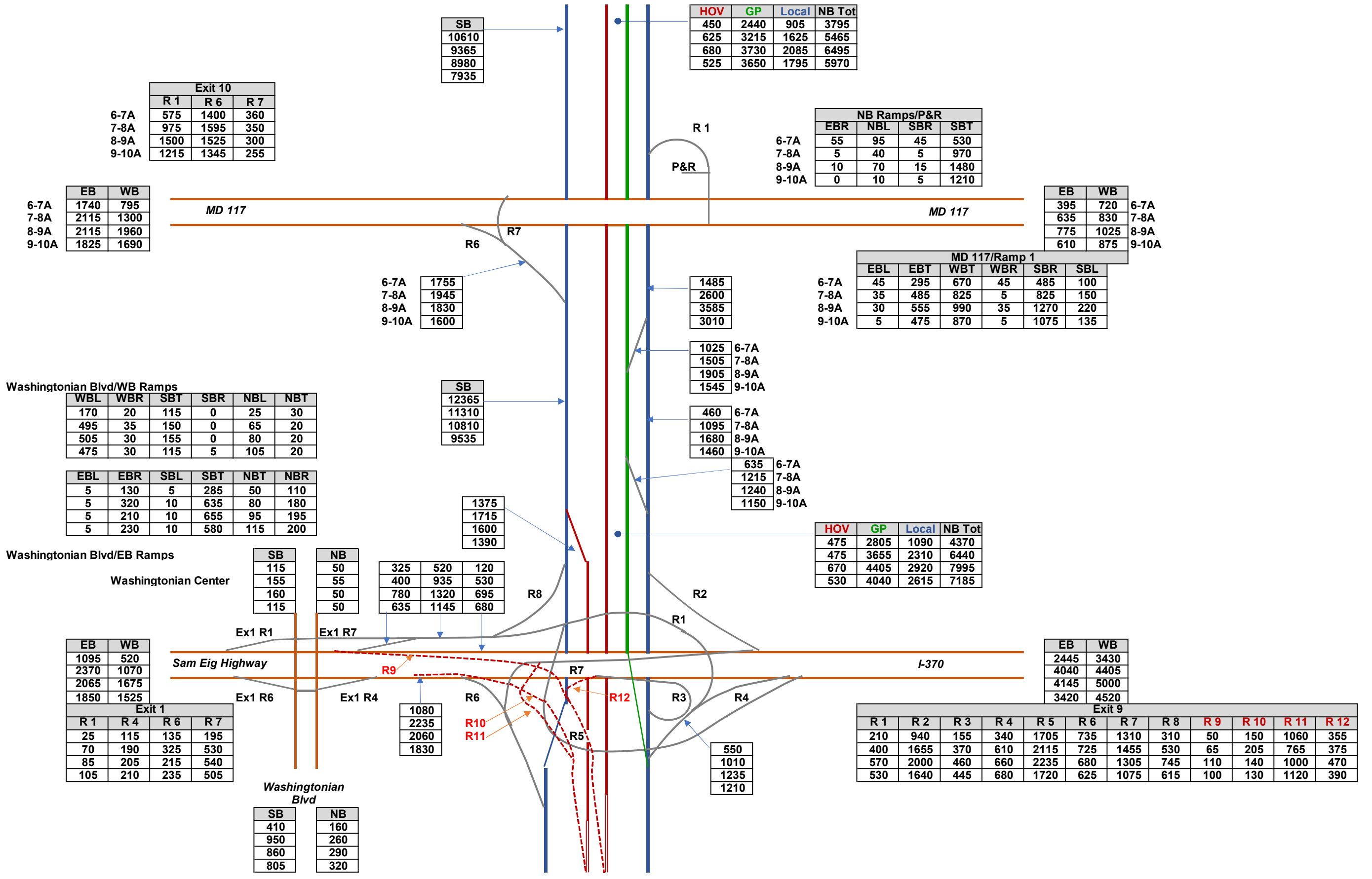
MD 124 (east)

EB	WB	
595	2530	6-7A
1375	3245	7-8A
2070	3350	8-9A
1990	2965	9-10A

SB Ramps/P&R

	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
6-7A	230	60	45	585	0	35	0	140	25
7-8A	585	60	35	1325	0	25	0	190	30
8-9A	1065	45	10	1545	0	10	0	25	5
9-10A	1165	25	0	1315	0	5	0	225	5

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



SB
10610
9365
8980
7935

HOV	GP	Local	NB Tot
450	2440	905	3795
625	3215	1625	5465
680	3730	2085	6495
525	3650	1795	5970

Exit 10

	R 1	R 6	R 7
6-7A	575	1400	360
7-8A	975	1595	350
8-9A	1500	1525	300
9-10A	1215	1345	255

NB Ramps/P&R

	EBR	NBL	SBR	SBT
6-7A	55	95	45	530
7-8A	5	40	5	970
8-9A	10	70	15	1480
9-10A	0	10	5	1210

	EB	WB
6-7A	1740	795
7-8A	2115	1300
8-9A	2115	1960
9-10A	1825	1690

EB	WB	
395	720	6-7A
635	830	7-8A
775	1025	8-9A
610	875	9-10A

MD 117/Ramp 1

	EBL	EBT	WBT	WBR	SBR	SBL
6-7A	45	295	670	45	485	100
7-8A	35	485	825	5	825	150
8-9A	30	555	990	35	1270	220
9-10A	5	475	870	5	1075	135

6-7A	1755
7-8A	1945
8-9A	1830
9-10A	1600

1485
2600
3585
3010

1025	6-7A
1505	7-8A
1905	8-9A
1545	9-10A

Washingtonian Blvd/WB Ramps

WBL	WBR	SBT	SBR	NBL	NBT
170	20	115	0	25	30
495	35	150	0	65	20
505	30	155	0	80	20
475	30	115	5	105	20

SB
12365
11310
10810
9535

460	6-7A
1095	7-8A
1680	8-9A
1460	9-10A

635	6-7A
1215	7-8A
1240	8-9A
1150	9-10A

EBL	EBR	SBL	SBT	NBT	NBR
5	130	5	285	50	110
5	320	10	635	80	180
5	210	10	655	95	195
5	230	10	580	115	200

Washingtonian Blvd/EB Ramps

1375
1715
1600
1390

HOV	GP	Local	NB Tot
475	2805	1090	4370
475	3655	2310	6440
670	4405	2920	7995
530	4040	2615	7185

SB
115
155
160
115

NB
50
55
50
50

325	520	120
400	935	530
780	1320	695
635	1145	680

EB	WB
1095	520
2370	1070
2065	1675
1850	1525

Exit 1

R 1	R 4	R 6	R 7
25	115	135	195
70	190	325	530
85	205	215	540
105	210	235	505

1080
2235
2060
1830

550
1010
1235
1210

EB	WB
2445	3430
4040	4405
4145	5000
3420	4520

Exit 9

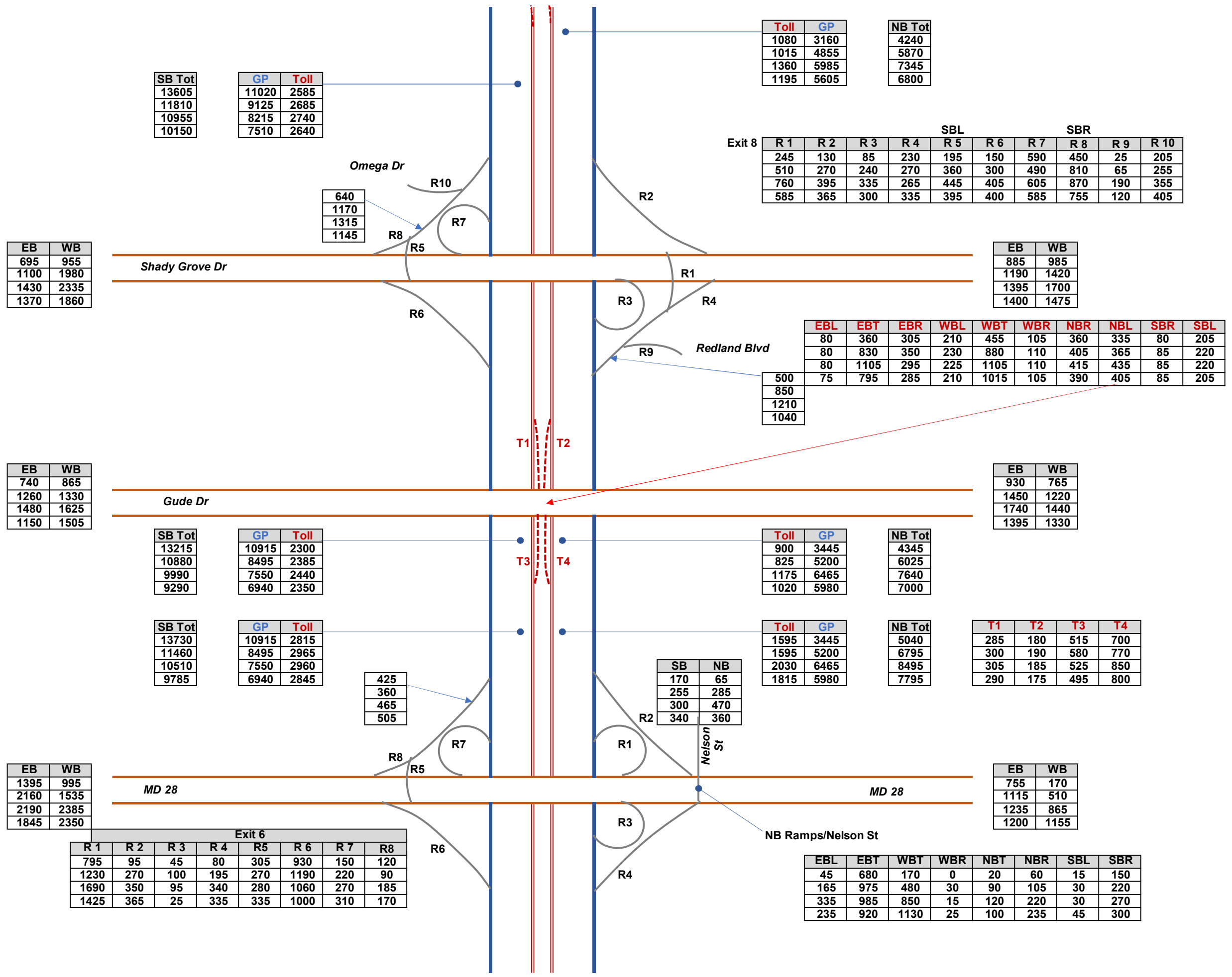
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12
210	940	155	340	1705	735	1310	310	50	150	1060	355
400	1655	370	610	2115	725	1455	530	65	205	765	375
570	2000	460	660	2235	680	1305	745	110	140	1000	470
530	1640	445	680	1720	625	1075	615	100	130	1120	390

Washingtonian Blvd

SB
410
950
860
805

NB
160
260
290
320

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



SB Tot
13605
11810
10955
10150

GP	Toll
11020	2585
9125	2685
8215	2740
7510	2640

Toll	GP
1080	3160
1015	4855
1360	5985
1195	5605

NB Tot
4240
5870
7345
6800

Exit 8

R 1	R 2	R 3	R 4	SBL R 5	R 6	R 7	SBR R 8	R 9	R 10
245	130	85	230	195	150	590	450	25	205
510	270	240	270	360	300	490	810	65	255
760	395	335	265	445	405	605	870	190	355
585	365	300	335	395	400	585	755	120	405

640
1170
1315
1145

EB	WB
695	955
1100	1980
1430	2335
1370	1860

EB	WB
885	985
1190	1420
1395	1700
1400	1475

EBL	EBT	EBR	WBL	WBT	WBR	NBR	NBL	SBR	SBL
80	360	305	210	455	105	360	335	80	205
80	830	350	230	880	110	405	365	85	220
80	1105	295	225	1105	110	415	435	85	220
75	795	285	210	1015	105	390	405	85	205

500
850
1210
1040

EB	WB
740	865
1260	1330
1480	1625
1150	1505

EB	WB
930	765
1450	1220
1740	1440
1395	1330

SB Tot
13215
10880
9990
9290

GP	Toll
10915	2300
8495	2385
7550	2440
6940	2350

Toll	GP
900	3445
825	5200
1175	6465
1020	5980

NB Tot
4345
6025
7640
7000

SB Tot
13730
11460
10510
9785

GP	Toll
10915	2815
8495	2965
7550	2960
6940	2845

Toll	GP
1595	3445
1595	5200
2030	6465
1815	5980

NB Tot
5040
6795
8495
7795

T1	T2	T3	T4
285	180	515	700
300	190	580	770
305	185	525	850
290	175	495	800

425
360
465
505

SB	NB
170	65
255	285
300	470
340	360

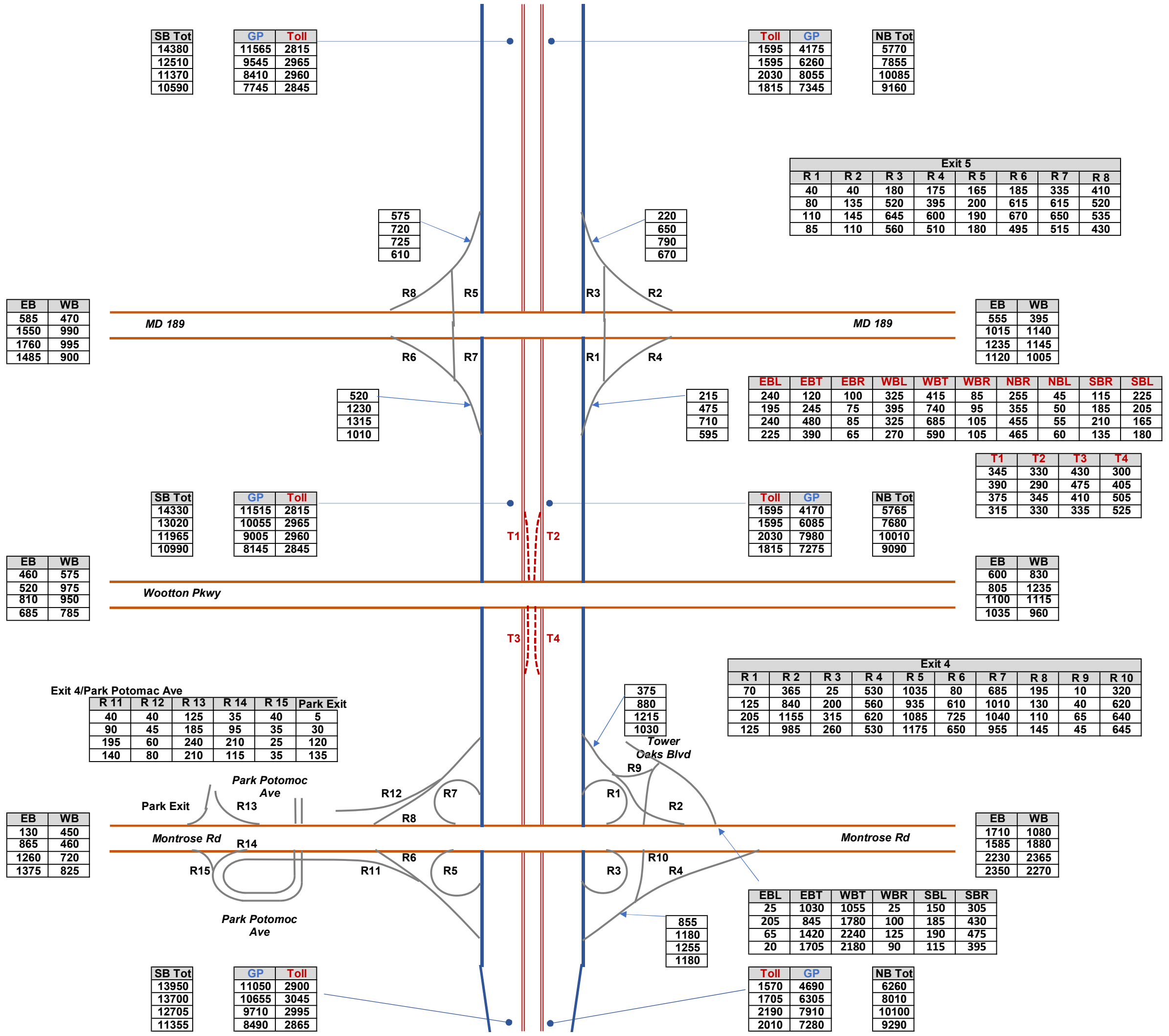
EB	WB
1395	995
2160	1535
2190	2385
1845	2350

EB	WB
755	170
1115	510
1235	865
1200	1155

Exit 6							
R 1	R 2	R 3	R 4	R5	R 6	R 7	R8
795	95	45	80	305	930	150	120
1230	270	100	195	270	1190	220	90
1690	350	95	340	280	1060	270	185
1425	365	25	335	335	1000	310	170

EBL	EBT	WBT	WBR	NBT	NBR	SBL	SBR
45	680	170	0	20	60	15	150
165	975	480	30	90	105	30	220
335	985	850	15	120	220	30	270
235	920	1130	25	100	235	45	300

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



SB Tot
14380
12510
11370
10590

GP	Toll
11565	2815
9545	2965
8410	2960
7745	2845

Toll	GP
1595	4175
1595	6260
2030	8055
1815	7345

NB Tot
5770
7855
10085
9160

Exit 5							
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
40	40	180	175	165	185	335	410
80	135	520	395	200	615	615	520
110	145	645	600	190	670	650	535
85	110	560	510	180	495	515	430

575
720
725
610

220
650
790
670

EB	WB
585	470
1550	990
1760	995
1485	900

EB	WB
555	395
1015	1140
1235	1145
1120	1005

EBL	EBT	EBR	WBL	WBT	WBR	NBR	NBL	SBR	SBL
240	120	100	325	415	85	255	45	115	225
195	245	75	395	740	95	355	50	185	205
240	480	85	325	685	105	455	55	210	165
225	390	65	270	590	105	465	60	135	180

520
1230
1315
1010

215
475
710
595

T1	T2	T3	T4
345	330	430	300
390	290	475	405
375	345	410	505
315	330	335	525

SB Tot
14330
13020
11965
10990

GP	Toll
11515	2815
10055	2965
9005	2960
8145	2845

Toll	GP
1595	4170
1595	6085
2030	7980
1815	7275

NB Tot
5765
7680
10010
9090

EB	WB
460	575
520	975
810	950
685	785

EB	WB
600	830
805	1235
1100	1115
1035	960

Exit 4									
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10
70	365	25	530	1035	80	685	195	10	320
125	840	200	560	935	610	1010	130	40	620
205	1155	315	620	1085	725	1040	110	65	640
125	985	260	530	1175	650	955	145	45	645

Exit 4/Park Potomac Ave

R 11	R 12	R 13	R 14	R 15	Park Exit
40	40	125	35	40	5
90	45	185	95	35	30
195	60	240	210	25	120
140	80	210	115	35	135

375
880
1215
1030

EB	WB
130	450
865	460
1260	720
1375	825

EB	WB
1710	1080
1585	1880
2230	2365
2350	2270

EBL	EBT	WBT	WBR	SBL	SBR
25	1030	1055	25	150	305
205	845	1780	100	185	430
65	1420	2240	125	190	475
20	1705	2180	90	115	395

855
1180
1255
1180

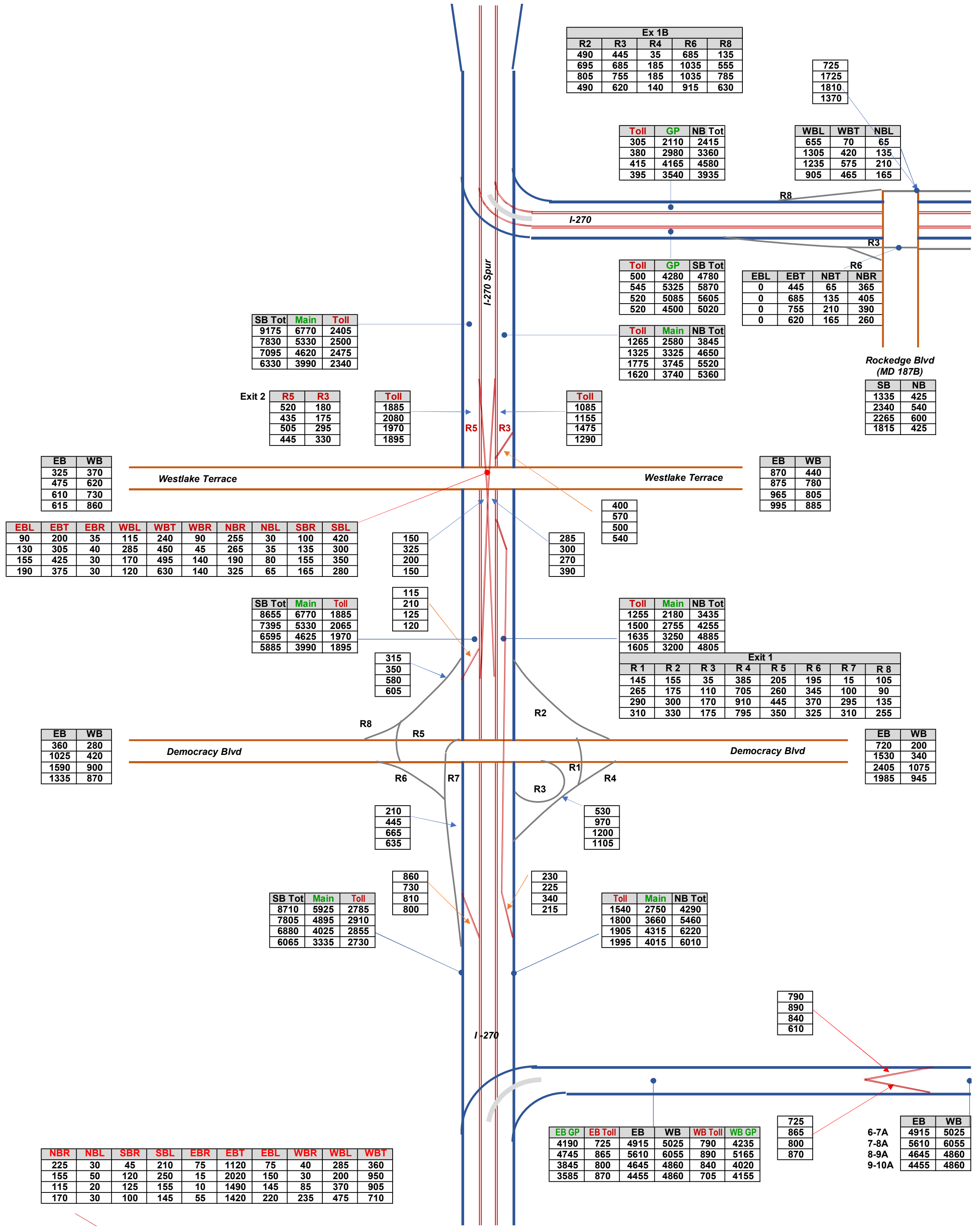
SB Tot
13950
13700
12705
11355

GP	Toll
11050	2900
10655	3045
9710	2995
8490	2865

Toll	GP
1570	4690
1705	6305
2190	7910
2010	7280

NB Tot
6260
8010
10100
9290

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



Ex 1B				
R2	R3	R4	R6	R8
490	445	35	685	135
695	685	185	1035	555
805	755	185	1035	785
490	620	140	915	630

725
1725
1810
1370

Toll	GP	NB Tot
305	2110	2415
380	2980	3360
415	4165	4580
395	3540	3935

WBL	WBT	NBL
655	70	65
1305	420	135
1235	575	210
905	465	165

Toll	GP	SB Tot
500	4280	4780
545	5325	5870
520	5085	5605
520	4500	5020

EBL	EBT	NBT	NBR
0	445	65	365
0	685	135	405
0	755	210	390
0	620	165	260

SB Tot	Main	Toll
9175	6770	2405
7830	5330	2500
7095	4620	2475
6330	3990	2340

Toll	Main	NB Tot
1265	2580	3845
1325	3325	4650
1775	3745	5520
1620	3740	5360

Rockedge Blvd (MD 187B)

SB	NB
1335	425
2340	540
2265	600
1815	425

Exit 2

R5	R3
520	180
435	175
505	295
445	330

Toll
1885
2080
1970
1895

Toll
1085
1155
1475
1290

EB	WB
325	370
475	620
610	730
615	860

EB	WB
870	440
875	780
965	805
995	885

400
570
500
540

EBL	EBT	EBR	WBL	WBT	WBR	NBR	NBL	SBR	SBL
90	200	35	115	240	90	255	30	100	420
130	305	40	285	450	45	265	35	135	300
155	425	30	170	495	140	190	80	155	350
190	375	30	120	630	140	325	65	165	280

150
325
200
150

285
300
270
390

115
210
125
120

SB Tot	Main	Toll
8655	6770	1885
7395	5330	2065
6595	4625	1970
5885	3990	1895

Toll	Main	NB Tot
1255	2180	3435
1500	2755	4255
1635	3250	4885
1605	3200	4805

315
350
580
605

Exit 1							
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
145	155	35	385	205	195	15	105
265	175	110	705	260	345	100	90
290	300	170	910	445	370	295	135
310	330	175	795	350	325	310	255

EB	WB
360	280
1025	420
1590	900
1335	870

EB	WB
720	200
1530	340
2405	1075
1985	945

210
445
665
635

530
970
1200
1105

860
730
810
800

230
225
340
215

SB Tot	Main	Toll
8710	5925	2785
7805	4895	2910
6880	4025	2855
6065	3335	2730

Toll	Main	NB Tot
1540	2750	4290
1800	3660	5460
1905	4315	6220
1995	4015	6010

790
890
840
610

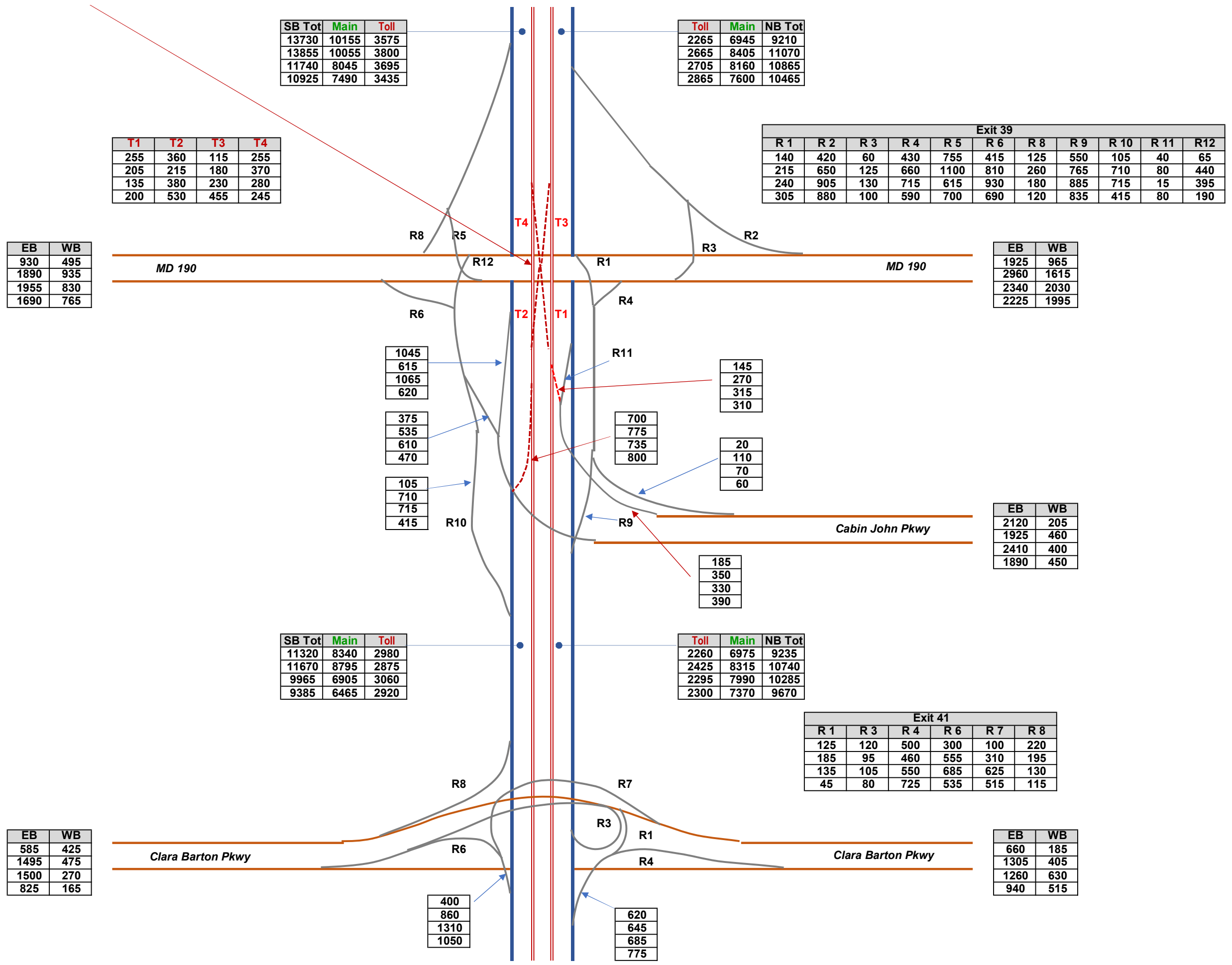
EB GP	EB Toll	EB	WB	WB Toll	WB GP
4190	725	4915	5025	790	4235
4745	865	5610	6055	890	5165
3845	800	4645	4860	840	4020
3585	870	4455	4860	705	4155

725
865
800
870

	EB	WB
6-7A	4915	5025
7-8A	5610	6055
8-9A	4645	4860
9-10A	4455	4860

NBR	NBL	SBR	SBL	EBR	EBT	EBL	WBR	WBL	WBT
225	30	45	210	75	1120	75	40	285	360
155	50	120	250	15	2020	150	30	200	950
115	20	125	155	10	1490	145	85	370	905
170	30	100	145	55	1420	220	235	475	710

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



SB Tot	Main	Toll
13730	10155	3575
13855	10055	3800
11740	8045	3695
10925	7490	3435

Toll	Main	NB Tot
2265	6945	9210
2665	8405	11070
2705	8160	10865
2865	7600	10465

T1	T2	T3	T4
255	360	115	255
205	215	180	370
135	380	230	280
200	530	455	245

Exit 39										
R 1	R 2	R 3	R 4	R 5	R 6	R 8	R 9	R 10	R 11	R12
140	420	60	430	755	415	125	550	105	40	65
215	650	125	660	1100	810	260	765	710	80	440
240	905	130	715	615	930	180	885	715	15	395
305	880	100	590	700	690	120	835	415	80	190

EB	WB
930	495
1890	935
1955	830
1690	765

EB	WB
1925	965
2960	1615
2340	2030
2225	1995

1045
615
1065
620

145
270
315
310

375
535
610
470

700
775
735
800

20
110
70
60

105
710
715
415

EB	WB
2120	205
1925	460
2410	400
1890	450

185
350
330
390

SB Tot	Main	Toll
11320	8340	2980
11670	8795	2875
9965	6905	3060
9385	6465	2920

Toll	Main	NB Tot
2260	6975	9235
2425	8315	10740
2295	7990	10285
2300	7370	9670

Exit 41					
R 1	R 3	R 4	R 6	R 7	R 8
125	120	500	300	100	220
185	95	460	555	310	195
135	105	550	685	625	130
45	80	725	535	515	115

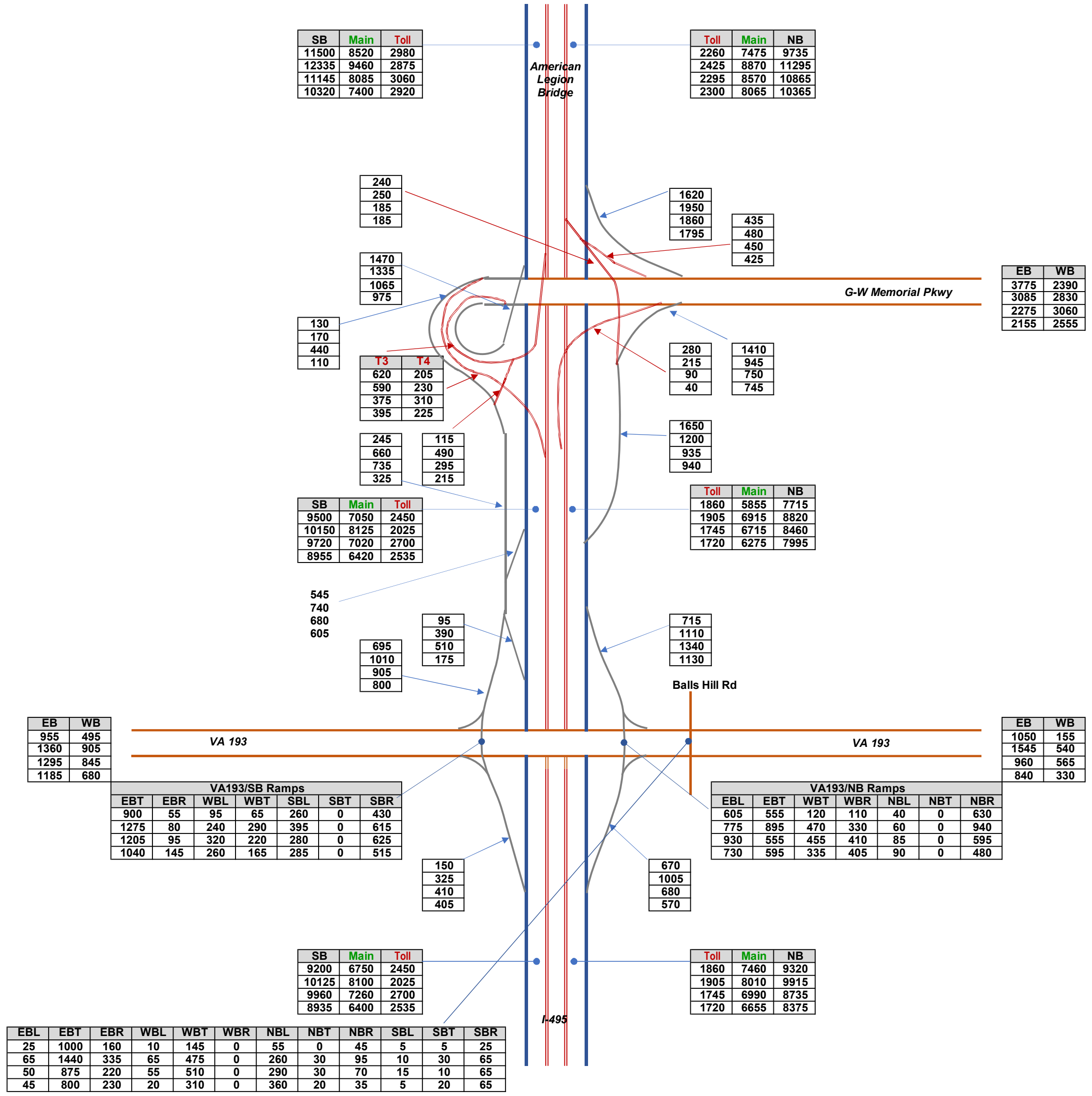
EB	WB
585	425
1495	475
1500	270
825	165

EB	WB
660	185
1305	405
1260	630
940	515

400
860
1310
1050

620
645
685
775

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



SB	Main	Toll
11500	8520	2980
12335	9460	2875
11145	8085	3060
10320	7400	2920

Toll	Main	NB
2260	7475	9735
2425	8870	11295
2295	8570	10865
2300	8065	10365

EB	WB
3775	2390
3085	2830
2275	3060
2155	2555

T3	T4
620	205
590	230
375	310
395	225

SB	Main	Toll
9500	7050	2450
10150	8125	2025
9720	7020	2700
8955	6420	2535

Toll	Main	NB
1860	5855	7715
1905	6915	8820
1745	6715	8460
1720	6275	7995

EB	WB
955	495
1360	905
1295	845
1185	680

EB	WB
1050	155
1545	540
960	565
840	330

VA193/SB Ramps

EBT	EBR	WBL	WBT	SBL	SBT	SBR
900	55	95	65	260	0	430
1275	80	240	290	395	0	615
1205	95	320	220	280	0	625
1040	145	260	165	285	0	515

VA193/NB Ramps

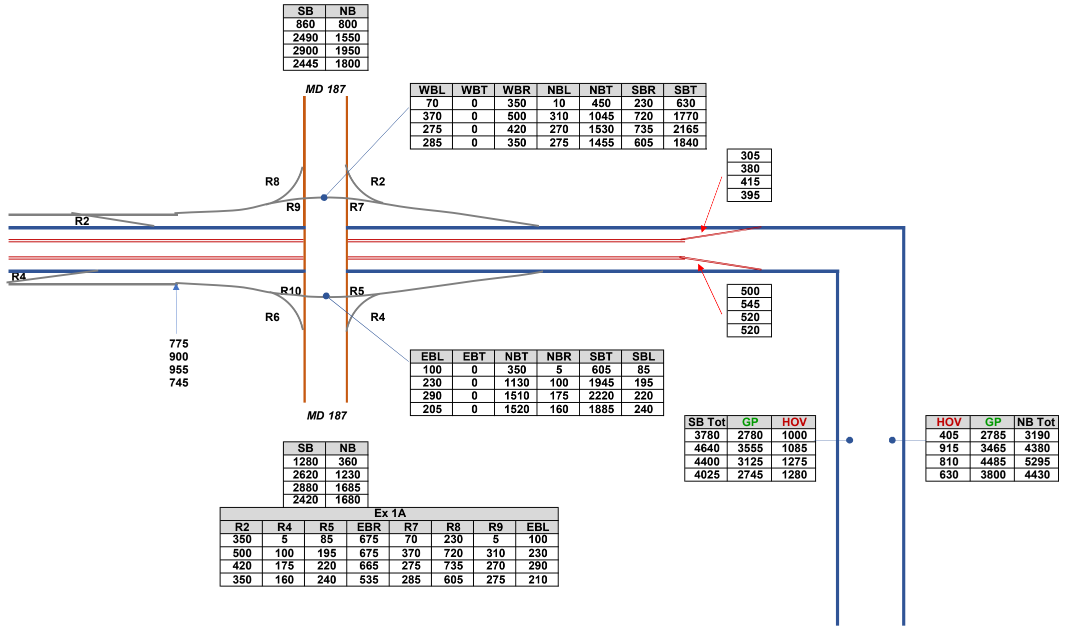
EBL	EBT	WBT	WBR	NBL	NBT	NBR
605	555	120	110	40	0	630
775	895	470	330	60	0	940
930	555	455	410	85	0	595
730	595	335	405	90	0	480

SB	Main	Toll
9200	6750	2450
10125	8100	2025
9960	7260	2700
8935	6400	2535

Toll	Main	NB
1860	7460	9320
1905	8010	9915
1745	6990	8735
1720	6655	8375

EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
25	1000	160	10	145	0	55	0	45	5	5	25
65	1440	335	65	475	0	260	30	95	10	30	65
50	875	220	55	510	0	290	30	70	15	10	65
45	800	230	20	310	0	360	20	35	5	20	65

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



SB	NB
860	800
2490	1550
2900	1950
2445	1800

WBL	WBT	WBR	NBL	NBT	SBR	SBT
70	0	350	10	450	230	630
370	0	500	310	1045	720	1770
275	0	420	270	1530	735	2165
285	0	350	275	1455	605	1840

305
380
415
395

500
545
520
520

EBL	EBT	NBT	NBR	SBT	SBL
100	0	350	5	605	85
230	0	1130	100	1945	195
290	0	1510	175	2220	220
205	0	1520	160	1885	240

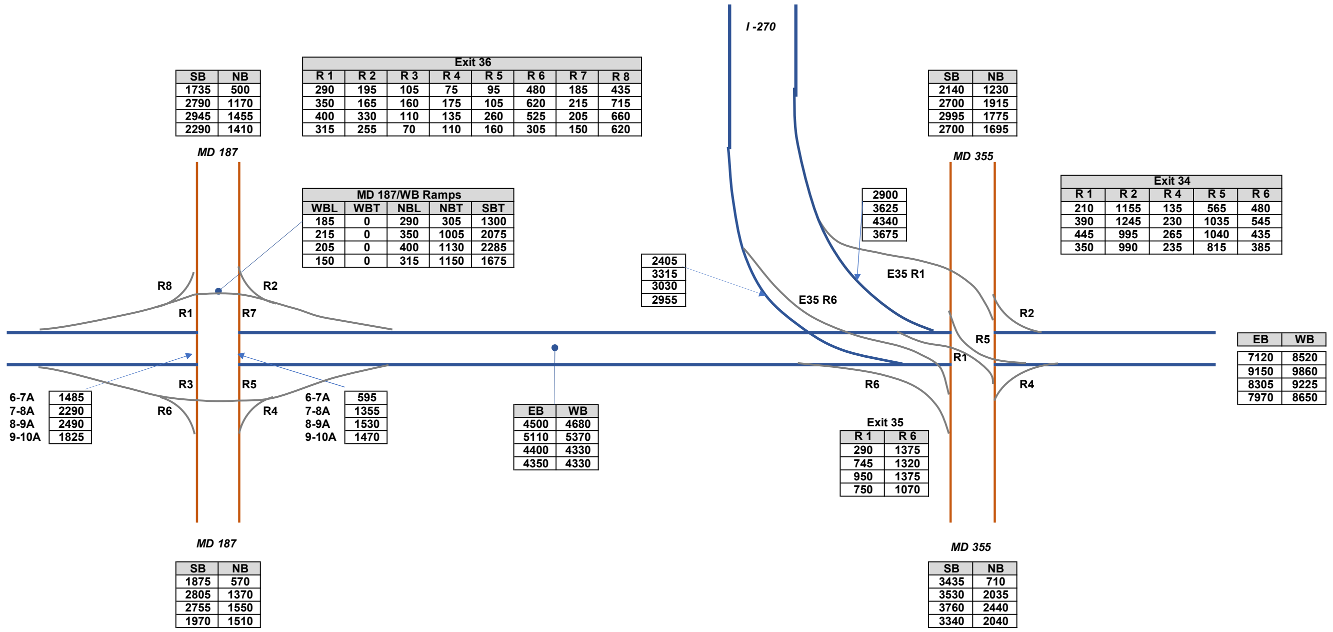
SB Tot	GP	HOV
3780	2780	1000
4640	3555	1085
4400	3125	1275
4025	2745	1280

HOV	GP	NB Tot
405	2785	3190
915	3465	4380
810	4485	5295
630	3800	4430

SB	NB
1280	360
2620	1230
2880	1685
2420	1680

Ex 1A							
R2	R4	R5	EBR	R7	R8	R9	EBL
350	5	85	675	70	230	5	100
500	100	195	675	370	720	310	230
420	175	220	665	275	735	270	290
350	160	240	535	285	605	275	210

I-270 & I-495 West Side AM
Future Preferred Alternative Peak Period Volumes



MD 187 (north)

SB	NB
1735	500
2790	1170
2945	1455
2290	1410

Exit 36

R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
290	195	105	75	95	480	185	435
350	165	160	175	105	620	215	715
400	330	110	135	260	525	205	660
315	255	70	110	160	305	150	620

MD 187/WB Ramps

WBL	WBT	NBL	NBT	SBT
185	0	290	305	1300
215	0	350	1005	2075
205	0	400	1130	2285
150	0	315	1150	1675

6-7A	1485
7-8A	2290
8-9A	2490
9-10A	1825

6-7A	595
7-8A	1355
8-9A	1530
9-10A	1470

MD 187 (south)

SB	NB
1875	570
2805	1370
2755	1550
1970	1510

2405
3315
3030
2955

EB	WB
4500	4680
5110	5370
4400	4330
4350	4330

2900
3625
4340
3675

MD 355 (north)

SB	NB
2140	1230
2700	1915
2995	1775
2700	1695

Exit 34

R 1	R 2	R 4	R 5	R 6
210	1155	135	565	480
390	1245	230	1035	545
445	995	265	1040	435
350	990	235	815	385

Exit 35

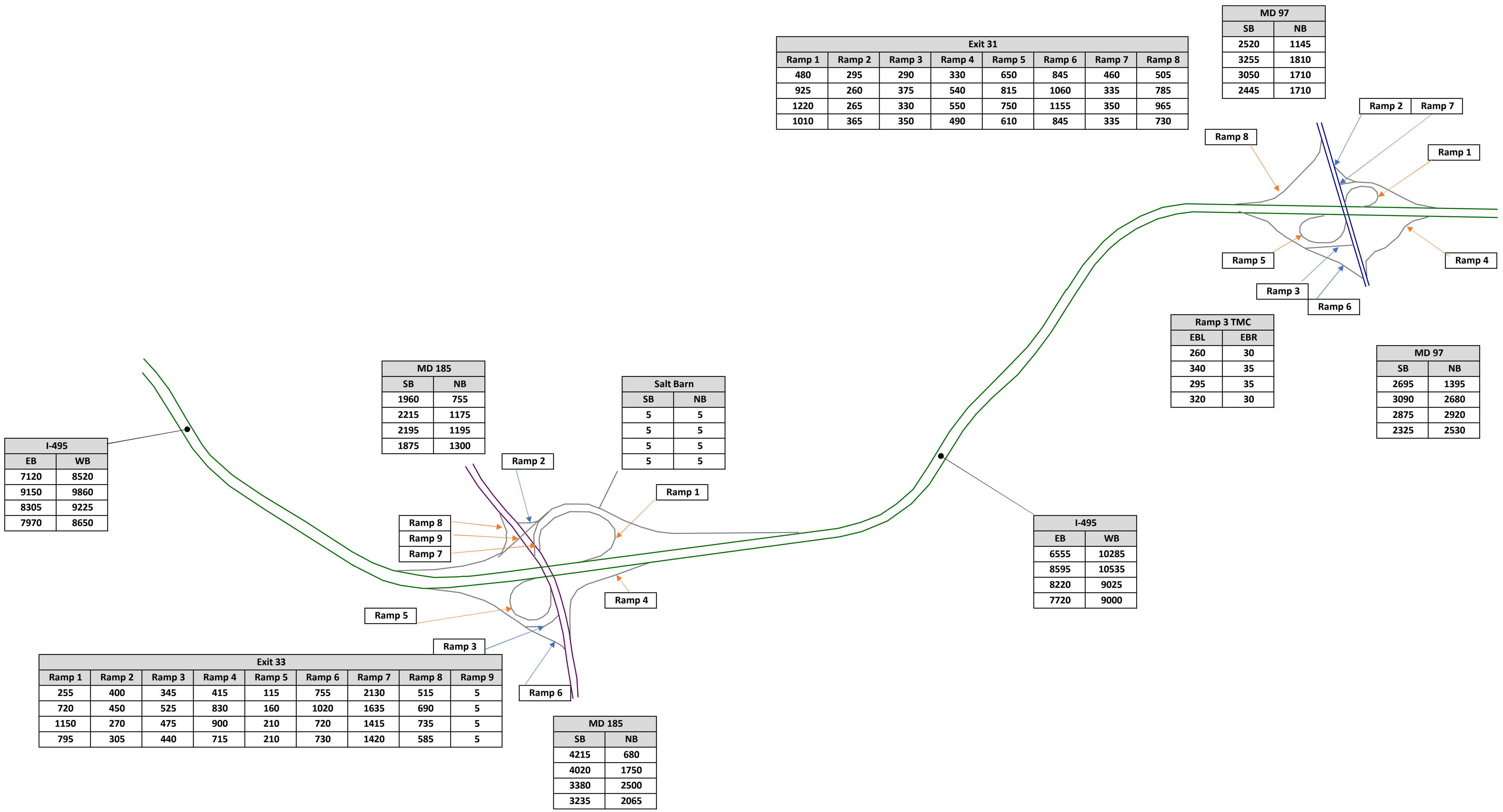
R 1	R 6
290	1375
745	1320
950	1375
750	1070

EB	WB
7120	8520
9150	9860
8305	9225
7970	8650

MD 355 (south)

SB	NB
3435	710
3530	2035
3760	2440
3340	2040

I-495 North Side AM
Future Preferred Alternative Peak Period Volumes



Exit 31							
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
480	295	290	330	650	845	460	505
925	260	375	540	815	1060	335	785
1220	265	330	550	750	1155	350	965
1010	365	350	490	610	845	335	730

MD 97	
SB	NB
2520	1145
3255	1810
3050	1710
2445	1710

Ramp 3 TMC	
EBL	EBR
260	30
340	35
295	35
320	30

MD 97	
SB	NB
2695	1395
3090	2680
2875	2920
2325	2530

MD 185	
SB	NB
1960	755
2215	1175
2195	1195
1875	1300

Salt Barn	
SB	NB
5	5
5	5
5	5
5	5

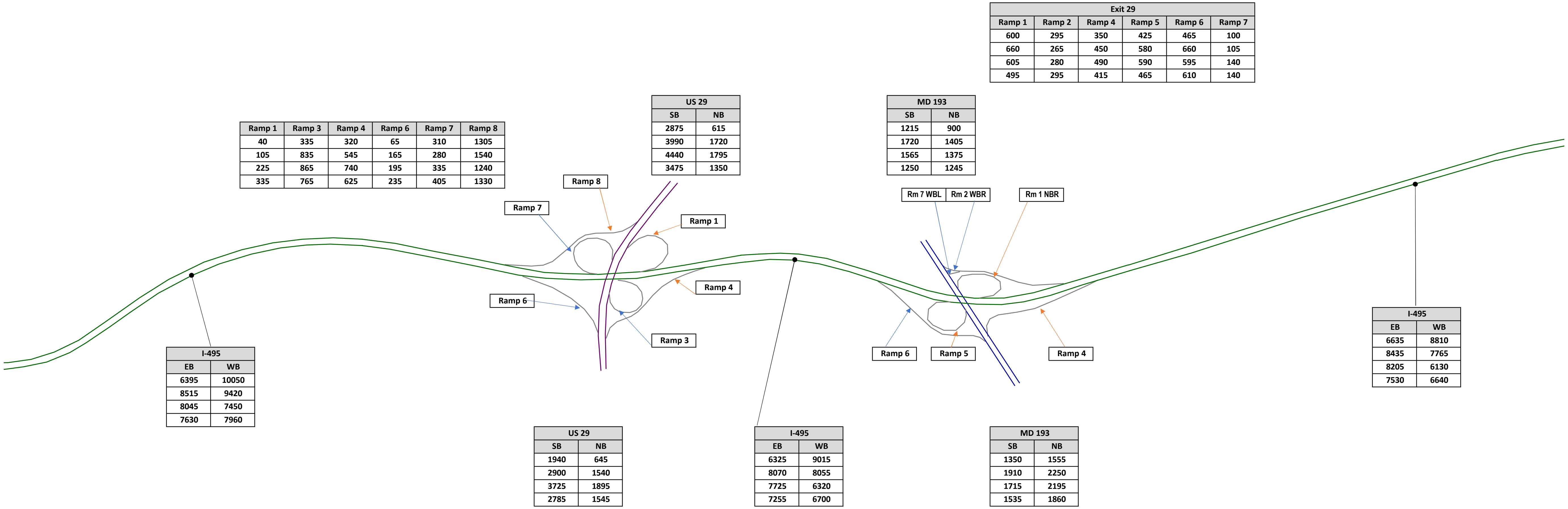
I-495	
EB	WB
7120	8520
9150	9860
8305	9225
7970	8650

I-495	
EB	WB
6555	10285
8595	10535
8220	9025
7720	9000

Exit 33								
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9
255	400	345	415	115	755	2130	515	5
720	450	525	830	160	1020	1635	690	5
1150	270	475	900	210	720	1415	735	5
795	305	440	715	210	730	1420	585	5

MD 185	
SB	NB
4215	680
4020	1750
3380	2500
3235	2065

I-495 North Side AM
Future Preferred Alternative Peak Period Volumes



Exit 29					
Ramp 1	Ramp 2	Ramp 4	Ramp 5	Ramp 6	Ramp 7
600	295	350	425	465	100
660	265	450	580	660	105
605	280	490	590	595	140
495	295	415	465	610	140

Ramp 1	Ramp 3	Ramp 4	Ramp 6	Ramp 7	Ramp 8
40	335	320	65	310	1305
105	835	545	165	280	1540
225	865	740	195	335	1240
335	765	625	235	405	1330

US 29	
SB	NB
2875	615
3990	1720
4440	1795
3475	1350

MD 193	
SB	NB
1215	900
1720	1405
1565	1375
1250	1245

I-495	
EB	WB
6635	8810
8435	7765
8205	6130
7530	6640

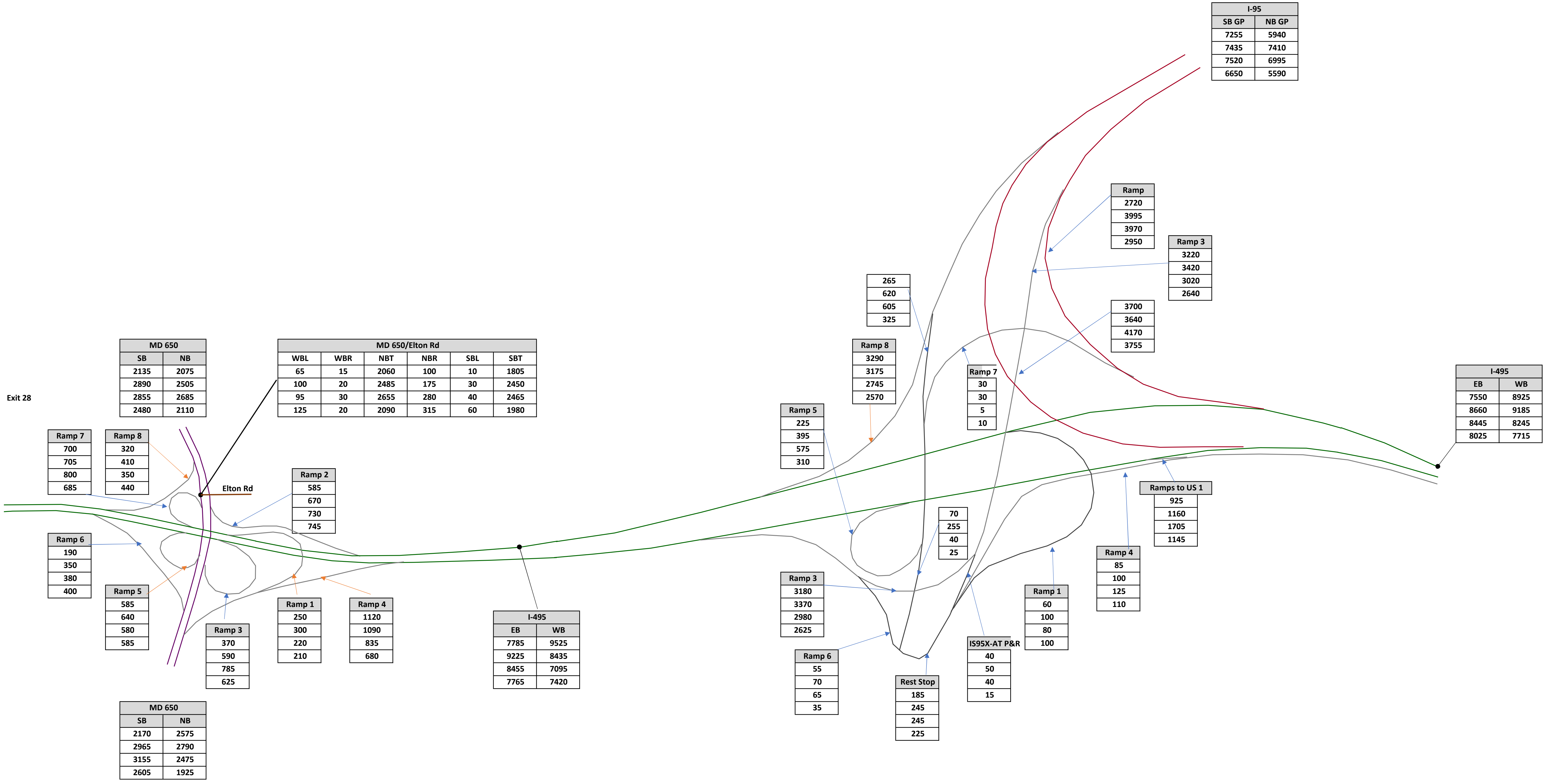
I-495	
EB	WB
6395	10050
8515	9420
8045	7450
7630	7960

US 29	
SB	NB
1940	645
2900	1540
3725	1895
2785	1545

I-495	
EB	WB
6325	9015
8070	8055
7725	6320
7255	6700

MD 193	
SB	NB
1350	1555
1910	2250
1715	2195
1535	1860

I-495 North Side AM
Future Preferred Alternative Peak Period Volumes



MD 650	
SB	NB
2135	2075
2890	2505
2855	2685
2480	2110

MD 650/Elton Rd					
WBL	WBR	NBT	NBR	SBL	SBT
65	15	2060	100	10	1805
100	20	2485	175	30	2450
95	30	2655	280	40	2465
125	20	2090	315	60	1980

Ramp 7
700
705
800
685

Ramp 8
320
410
350
440

Ramp 2
585
670
730
745

Ramp 6
190
350
380
400

Ramp 5
585
640
580
585

Ramp 3
370
590
785
625

Ramp 1
250
300
220
210

Ramp 4
1120
1090
835
680

MD 650	
SB	NB
2170	2575
2965	2790
3155	2475
2605	1925

I-495	
EB	WB
7785	9525
9225	8435
8455	7095
7765	7420

265
620
605
325

Ramp 8
3290
3175
2745
2570

Ramp 5
225
395
575
310

Ramp 7
30
30
5
10

70
255
40
25

Ramp 3
3180
3370
2980
2625

Ramp 6
55
70
65
35

Rest Stop
185
245
245
225

IS95X-AT P&R
40
50
40
15

Ramp 1
60
100
80
100

Ramp 4
85
100
125
110

Ramps to US 1
925
1160
1705
1145

I-95	
SB GP	NB GP
7255	5940
7435	7410
7520	6995
6650	5590

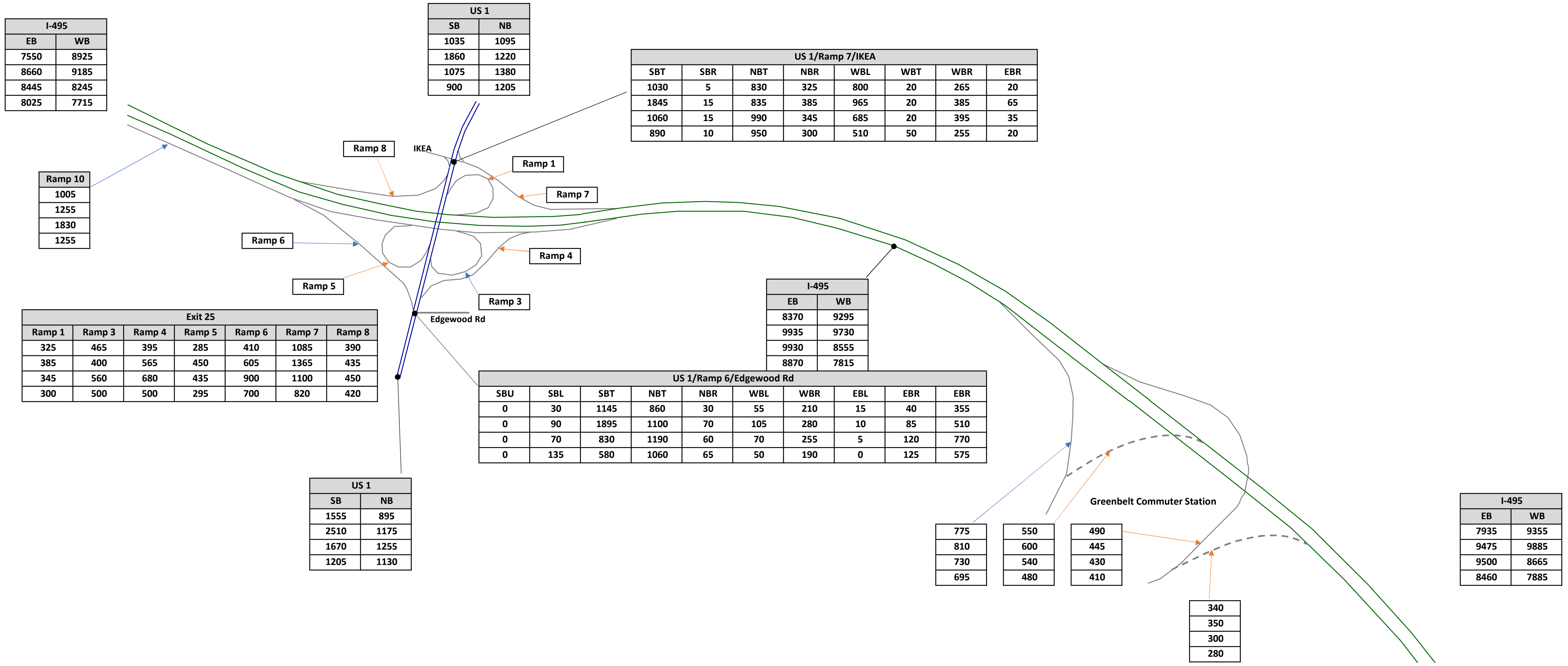
Ramp
2720
3995
3970
2950

Ramp 3
3220
3420
3020
2640

3700
3640
4170
3755

I-495	
EB	WB
7550	8925
8660	9185
8445	8245
8025	7715

I-495 North East Side AM
Future Preferred Alternative Peak Period Volumes



I-495	
EB	WB
7550	8925
8660	9185
8445	8245
8025	7715

US 1	
SB	NB
1035	1095
1860	1220
1075	1380
900	1205

US 1/Ramp 7/IKEA							
SBT	SBR	NBT	NBR	WBL	WBT	WBR	EBR
1030	5	830	325	800	20	265	20
1845	15	835	385	965	20	385	65
1060	15	990	345	685	20	395	35
890	10	950	300	510	50	255	20

Ramp 10
1005
1255
1830
1255

Exit 25						
Ramp 1	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
325	465	395	285	410	1085	390
385	400	565	450	605	1365	435
345	560	680	435	900	1100	450
300	500	500	295	700	820	420

I-495	
EB	WB
8370	9295
9935	9730
9930	8555
8870	7815

US 1/Ramp 6/Edgewood Rd									
SBU	SBL	SBT	NBT	NBR	WBL	WBR	EBL	EBR	EBR
0	30	1145	860	30	55	210	15	40	355
0	90	1895	1100	70	105	280	10	85	510
0	70	830	1190	60	70	255	5	120	770
0	135	580	1060	65	50	190	0	125	575

US 1	
SB	NB
1555	895
2510	1175
1670	1255
1205	1130

775
810
730
695

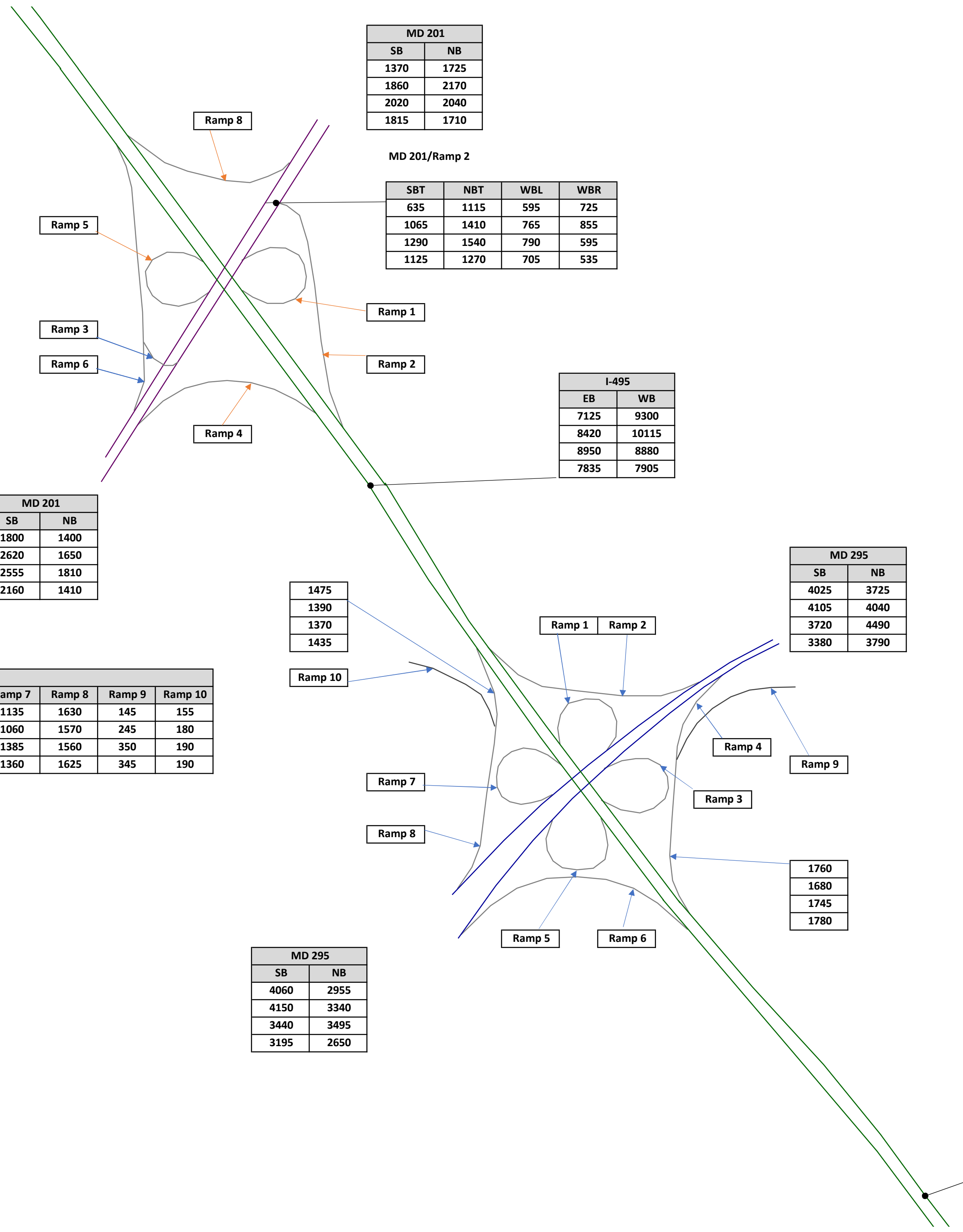
550
600
540
480

490
445
430
410

340
350
300
280

I-495	
EB	WB
7935	9355
9475	9885
9500	8665
8460	7885

I-495 North East Side AM
Future Preferred Alternative Peak Period Volumes



Exit 23						
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8
675	1320	600	325	415	950	700
615	1625	655	375	495	1265	780
450	1385	635	545	700	1165	720
540	1240	765	460	655	970	680

MD 201	
SB	NB
1370	1725
1860	2170
2020	2040
1815	1710

MD 201/Ramp 2

SBT	NBT	WBL	WBR
635	1115	595	725
1065	1410	765	855
1290	1540	790	595
1125	1270	705	535

I-495	
EB	WB
7125	9300
8420	10115
8950	8880
7835	7905

MD 201	
SB	NB
1800	1400
2620	1650
2555	1810
2160	1410

Exit 22									
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
25	475	1330	1615	510	25	1135	1630	145	155
55	515	1385	1435	690	35	1060	1570	245	180
60	510	1250	1395	880	30	1385	1560	350	190
50	495	1060	1435	800	35	1360	1625	345	190

1475
1390
1370
1435

MD 295	
SB	NB
4025	3725
4105	4040
3720	4490
3380	3790

	MD 193	
	EB	WB
6AM	550	1035
7AM	1010	2645
8AM	1595	2475
9AM	1345	1985

MD 193

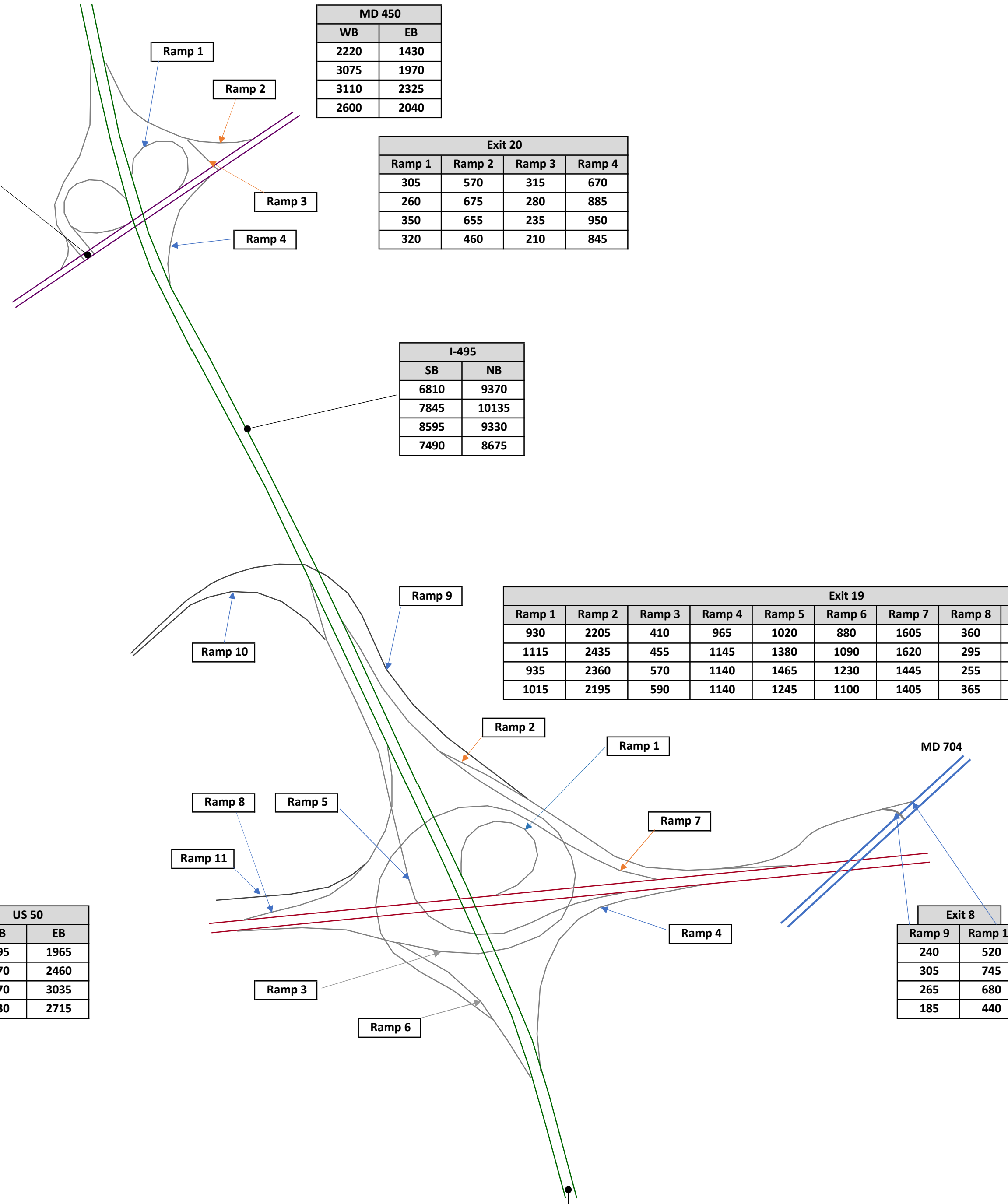
6AM
7AM
8AM
9AM

1760
1680
1745
1780

MD 295	
SB	NB
4060	2955
4150	3340
3440	3495
3195	2650

I-495	
SB	NB
6300	9280
7440	9945
8110	8920
7000	8180

I-495 North East Side AM
Future Preferred Alternative Peak Period Volumes



MD 450	
WB	EB
2220	1430
3075	1970
3110	2325
2600	2040

Exit 20

↲ Ramp 8	↳ Ramp 5	⬏ Ramp 6	⬑ Ramp 7
275	280	350	715
425	345	375	800
410	375	420	850
265	330	350	740

Exit 20			
Ramp 1	Ramp 2	Ramp 3	Ramp 4
305	570	315	670
260	675	280	885
350	655	235	950
320	460	210	845

MD 450	
WB	EB
1520	1150
2290	1395
2370	1655
1990	1425

I-495	
SB	NB
6810	9370
7845	10135
8595	9330
7490	8675

Exit 19										
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10	Ramp 11
930	2205	410	965	1020	880	1605	360	645	10	385
1115	2435	455	1145	1380	1090	1620	295	870	5	465
935	2360	570	1140	1465	1230	1445	255	670	35	460
1015	2195	590	1140	1245	1100	1405	365	395	20	335

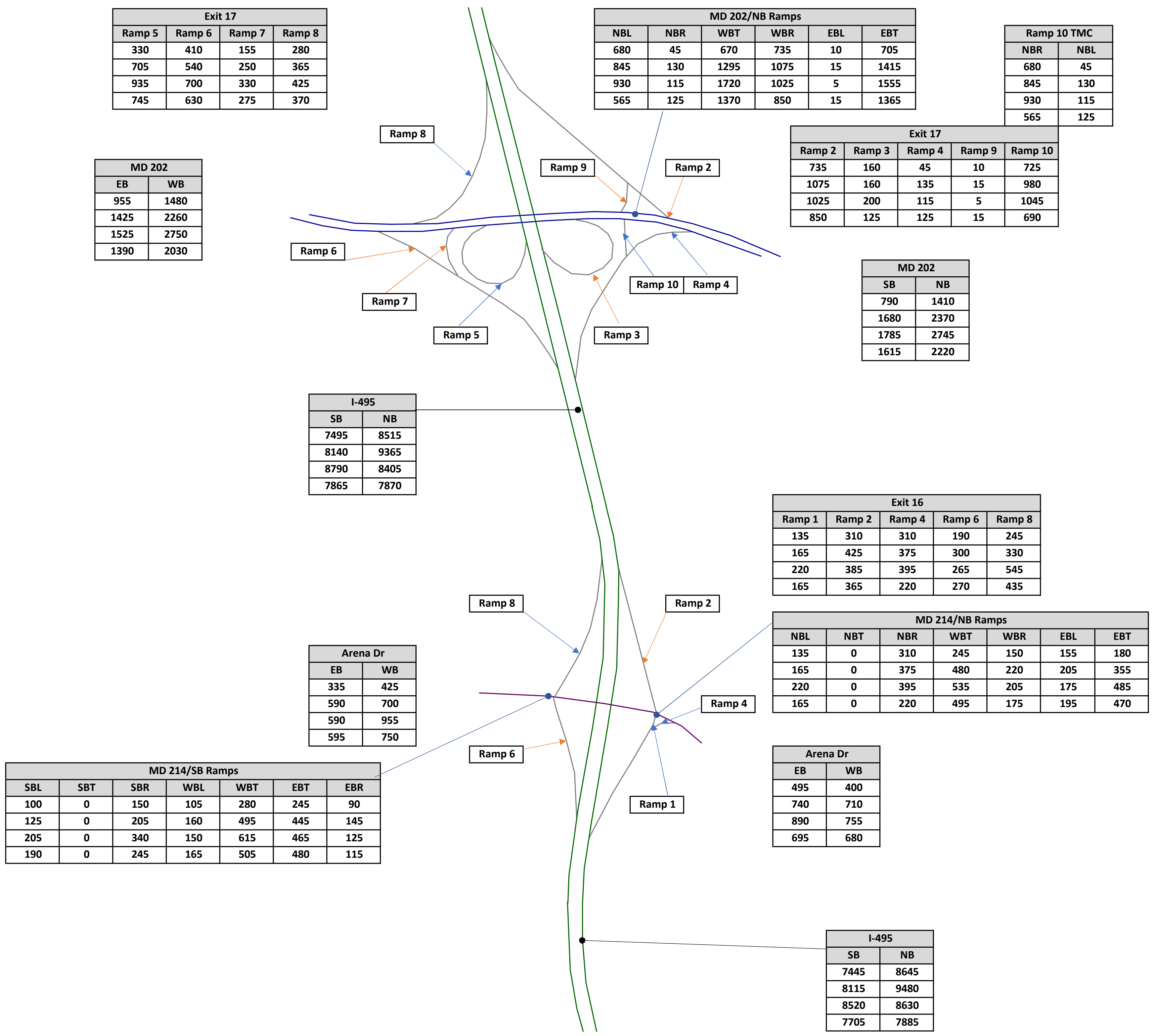
US-50	
WB	EB
7095	2655
7525	3435
7110	3840
6020	3410

US 50	
WB	EB
4695	1965
5070	2460
4770	3035
4030	2715

Exit 8	
Ramp 9	Ramp 10
240	520
305	745
265	680
185	440

I-495	
SB	NB
7540	8645
8415	9500
9125	8470
8075	8045

I-495 East Side AM
Future Preferred Alternative Peak Period Volumes



Exit 17			
Ramp 5	Ramp 6	Ramp 7	Ramp 8
330	410	155	280
705	540	250	365
935	700	330	425
745	630	275	370

MD 202/NB Ramps					
NBL	NBR	WBT	WBR	EBL	EBT
680	45	670	735	10	705
845	130	1295	1075	15	1415
930	115	1720	1025	5	1555
565	125	1370	850	15	1365

Ramp 10 TMC	
NBR	NBL
680	45
845	130
930	115
565	125

Exit 17				
Ramp 2	Ramp 3	Ramp 4	Ramp 9	Ramp 10
735	160	45	10	725
1075	160	135	15	980
1025	200	115	5	1045
850	125	125	15	690

MD 202	
EB	WB
955	1480
1425	2260
1525	2750
1390	2030

MD 202	
SB	NB
790	1410
1680	2370
1785	2745
1615	2220

I-495	
SB	NB
7495	8515
8140	9365
8790	8405
7865	7870

Exit 16				
Ramp 1	Ramp 2	Ramp 4	Ramp 6	Ramp 8
135	310	310	190	245
165	425	375	300	330
220	385	395	265	545
165	365	220	270	435

MD 214/NB Ramps						
NBL	NBT	NBR	WBT	WBR	EBL	EBT
135	0	310	245	150	155	180
165	0	375	480	220	205	355
220	0	395	535	205	175	485
165	0	220	495	175	195	470

Arena Dr	
EB	WB
335	425
590	700
590	955
595	750

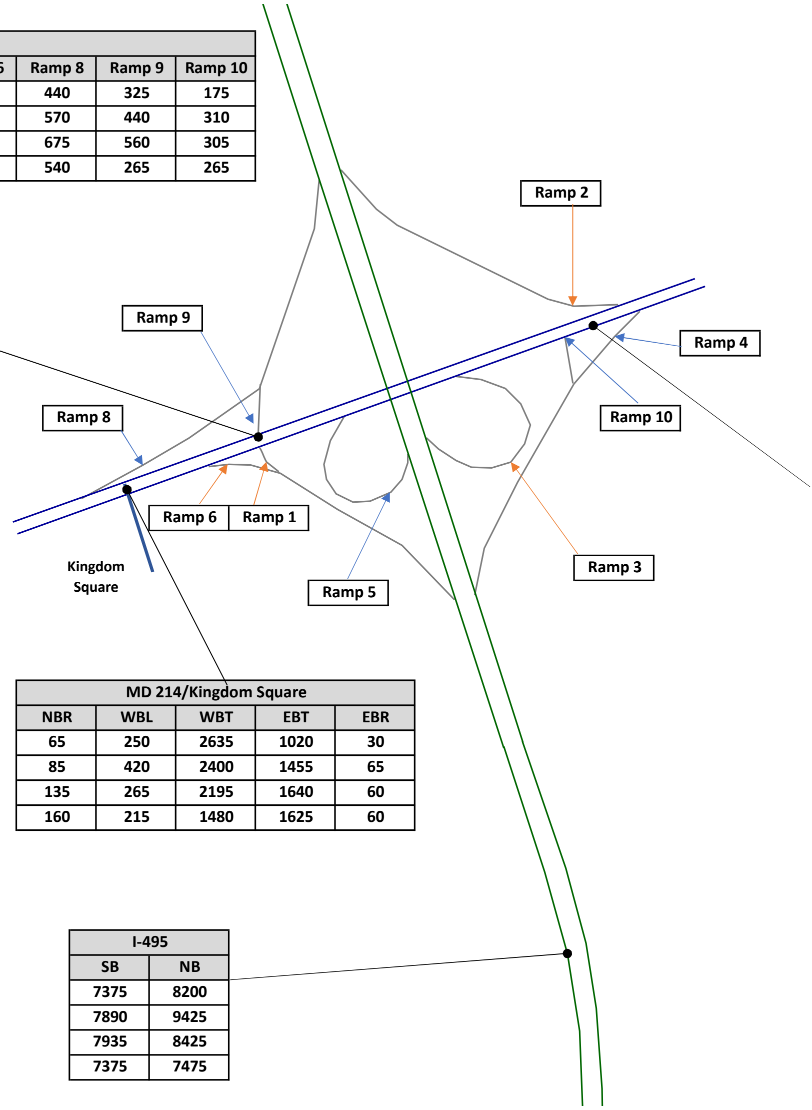
MD 214/SB Ramps						
SBL	SBT	SBR	WBL	WBT	EBT	EBR
100	0	150	105	280	245	90
125	0	205	160	495	445	145
205	0	340	150	615	465	125
190	0	245	165	505	480	115

Arena Dr	
EB	WB
495	400
740	710
890	755
695	680

I-495	
SB	NB
7445	8645
8115	9480
8520	8630
7705	7885

I-495 East Side AM
Future Preferred Alternative Peak Period Volumes

Exit 15								
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8	Ramp 9	Ramp 10
925	525	660	565	505	275	440	325	175
1130	590	815	1040	665	315	570	440	310
1035	525	835	850	755	370	675	560	305
815	510	810	645	740	405	540	265	265



MD 214	
EB	WB
1220	3400
2110	3225
2175	2485
1950	1945

MD 214/SB Ramps				
SBR	WBL	WBT	EBT	EBR
325	925	2125	805	275
440	1130	1815	1220	315
560	1035	1225	1405	370
265	815	885	1380	405

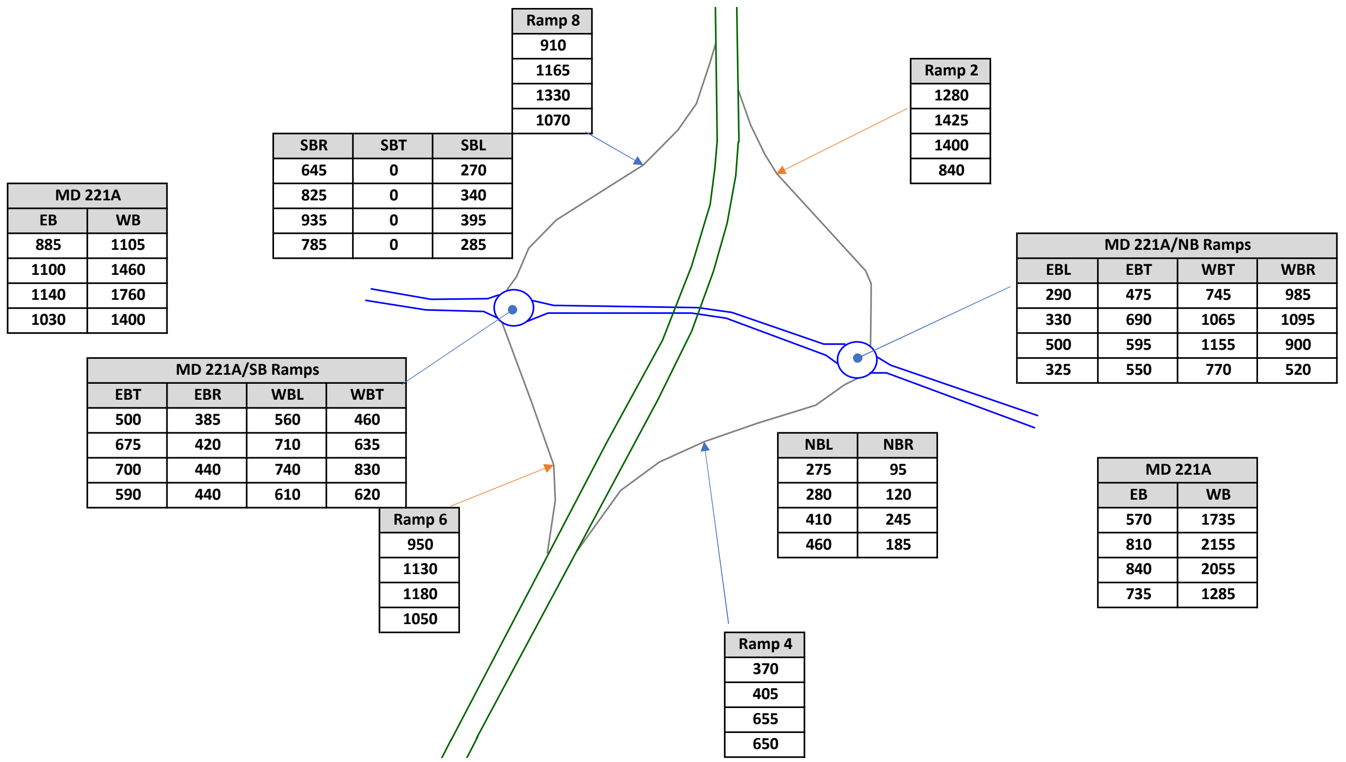
MD 214/NB Ramps				
NBL	NBR	WBT	WBR	EBT
175	565	2850	525	655
310	1040	2635	590	1070
305	850	1960	525	1325
265	645	1435	510	1305

MD 214	
EB	WB
1050	2635
1520	2400
1700	2195
1685	1480

MD 214/Kingdom Square				
NBR	WBL	WBT	EBT	EBR
65	250	2635	1020	30
85	420	2400	1455	65
135	265	2195	1640	60
160	215	1480	1625	60

I-495	
SB	NB
7375	8200
7890	9425
7935	8425
7375	7475

I-495 East Side AM
Future Preferred Alternative Peak Period Volumes



Ramp 8
910
1165
1330
1070

SBR	SBT	SBL
645	0	270
825	0	340
935	0	395
785	0	285

MD 221A	
EB	WB
885	1105
1100	1460
1140	1760
1030	1400

Ramp 2
1280
1425
1400
840

MD 221A/NB Ramps			
EBL	EBT	WBT	WBR
290	475	745	985
330	690	1065	1095
500	595	1155	900
325	550	770	520

MD 221A/SB Ramps			
EBT	EBR	WBL	WBT
500	385	560	460
675	420	710	635
700	440	740	830
590	440	610	620

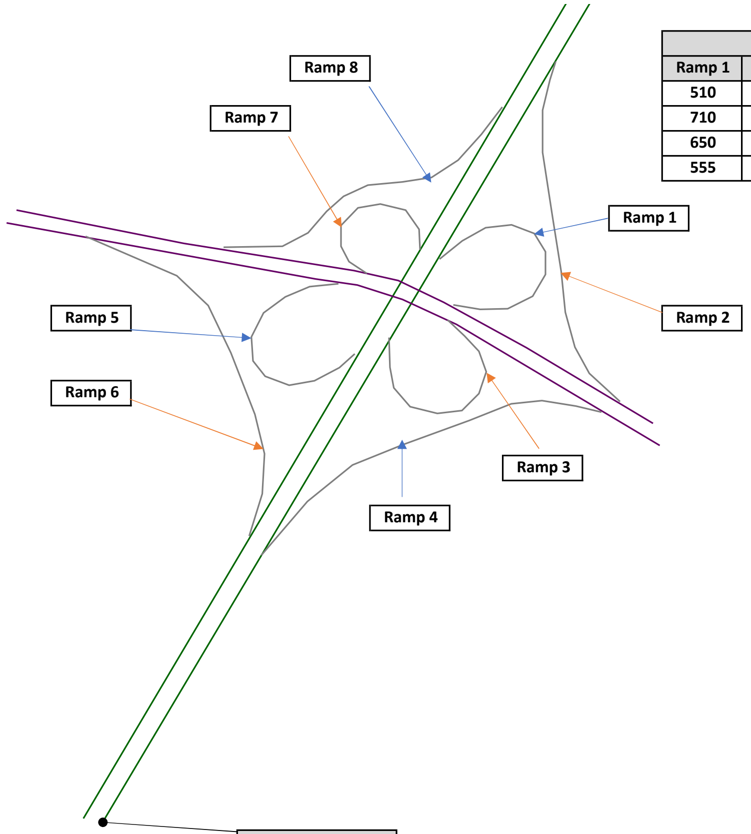
NBL	NBR
275	95
280	120
410	245
460	185

Ramp 6
950
1130
1180
1050

MD 221A	
EB	WB
570	1735
810	2155
840	2055
735	1285

Ramp 4
370
405
655
650

I-495 East Side AM
Future Preferred Alternative Peak Period Volumes



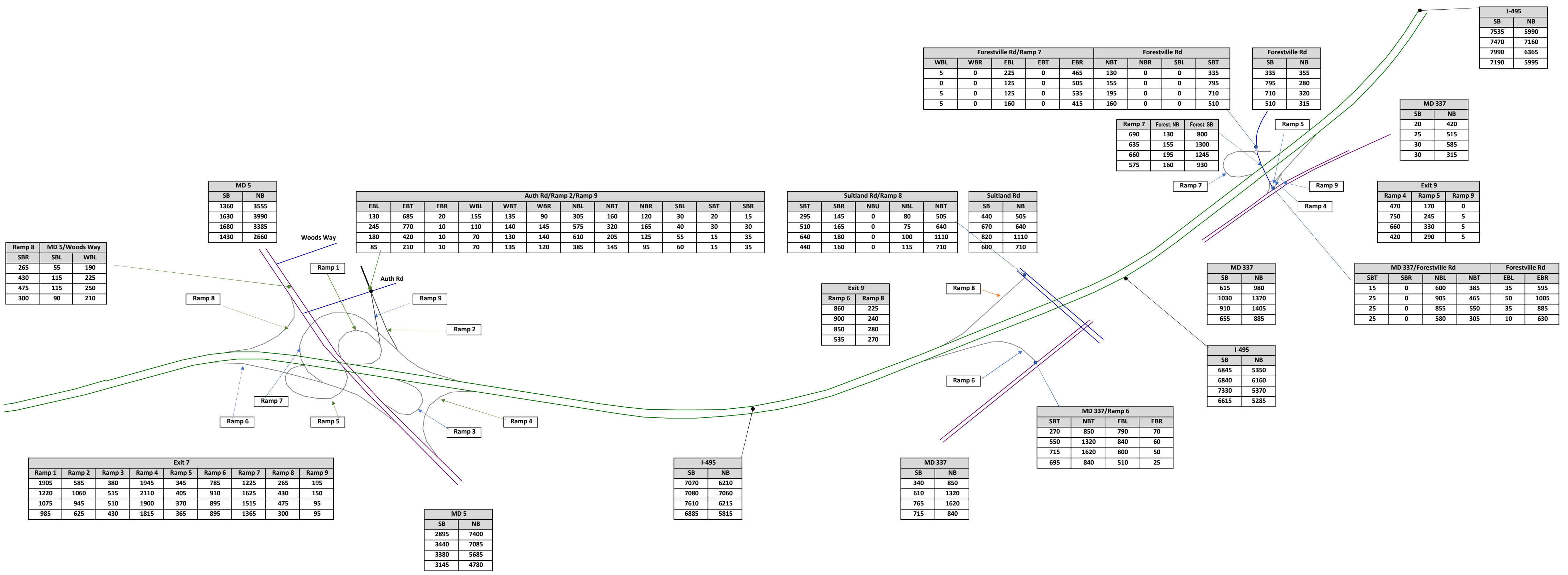
Exit 11							
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
510	1995	425	605	760	475	1415	1005
710	2010	495	550	665	440	1100	1255
650	2065	495	595	515	465	1025	770
555	1915	465	545	585	375	850	810

MD 4	
SB	NB
1250	1995
1565	3105
1490	2185
1380	1605

MD 4	
SB	NB
1715	3890
1845	4245
1640	3855
1670	3010

I-495	
SB	NB
7535	5990
7470	7160
7990	6365
7190	5995

I-495 South Side AM
Future Preferred Alternative Peak Period Volumes



Ramp 8	MD 5/Woods Way	
SBR	SBL	WBL
265	55	190
430	115	225
475	115	250
300	90	210

MD 5	
SB	NB
1360	3555
1630	3990
1680	3385
1430	2660

Auth Rd/Ramp 2/Ramp 9											
EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
130	685	20	155	135	90	305	160	120	30	20	15
245	770	10	110	140	145	575	320	165	40	30	30
180	420	10	70	130	140	610	205	125	55	15	35
85	210	10	70	135	120	385	145	95	60	15	35

Suitland Rd/Ramp 8				
SBT	SBR	NBU	NBL	NBT
295	145	0	80	505
510	165	0	75	640
640	180	0	100	1110
440	160	0	115	710

Suitland Rd	
SB	NB
440	505
670	640
820	1110
600	710

Forestville Rd/Ramp 7					Forestville Rd			
WBL	WBR	EBL	EBT	EBR	NBT	NBR	SBL	SBT
5	0	225	0	465	130	0	0	335
0	0	125	0	505	155	0	0	795
5	0	125	0	535	195	0	0	710
5	0	160	0	415	160	0	0	510

Forestville Rd	
SB	NB
335	355
795	280
710	320
510	315

Ramp 7	Forest. NB	Forest. SB
690	130	800
635	155	1300
660	195	1245
575	160	930

I-495	
SB	NB
7535	5990
7470	7160
7990	6365
7190	5995

MD 337	
SB	NB
20	420
25	515
30	585
30	315

Exit 9		
Ramp 4	Ramp 5	Ramp 9
470	170	0
750	245	5
660	330	5
420	290	5

MD 337	
SB	NB
615	980
1030	1370
910	1405
655	885

MD 337/Forestville Rd				Forestville Rd	
SBT	SBR	NBL	NBT	EBL	EBR
15	0	600	385	35	595
25	0	905	465	50	1005
25	0	855	550	35	885
25	0	580	305	10	630

Exit 9	
Ramp 6	Ramp 8
860	225
900	240
850	280
535	270

I-495	
SB	NB
6845	5350
6840	6160
7330	5370
6615	5285

MD 337/Ramp 6			
SBT	NBT	EBL	EBR
270	850	790	70
550	1320	840	60
715	1620	800	50
695	840	510	25

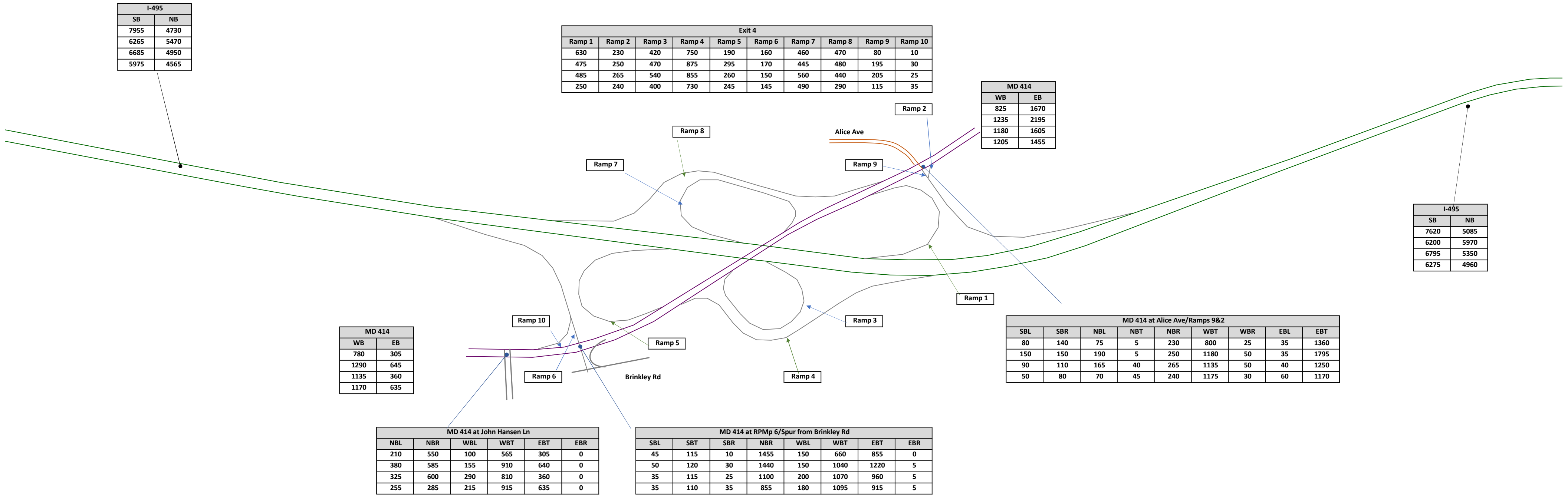
Exit 7								
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9
1905	585	380	1945	345	785	1225	265	195
1220	1060	515	2110	405	910	1625	430	150
1075	945	510	1900	370	895	1515	475	95
985	625	430	1815	365	895	1365	300	95

I-495	
SB	NB
7070	6210
7080	7060
7610	6215
6885	5815

MD 337	
SB	NB
340	850
610	1320
765	1620
715	840

MD 5	
SB	NB
2895	7400
3440	7085
3380	5685
3145	4780

I-495 South Side AM
Future Preferred Alternative Peak Period Volumes



I-495	
SB	NB
7955	4730
6265	5470
6685	4950
5975	4565

Exit 4									
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
630	230	420	750	190	160	460	470	80	10
475	250	470	875	295	170	445	480	195	30
485	265	540	855	260	150	560	440	205	25
250	240	400	730	245	145	490	290	115	35

MD 414	
WB	EB
825	1670
1235	2195
1180	1605
1205	1455

I-495	
SB	NB
7620	5085
6200	5970
6795	5350
6275	4960

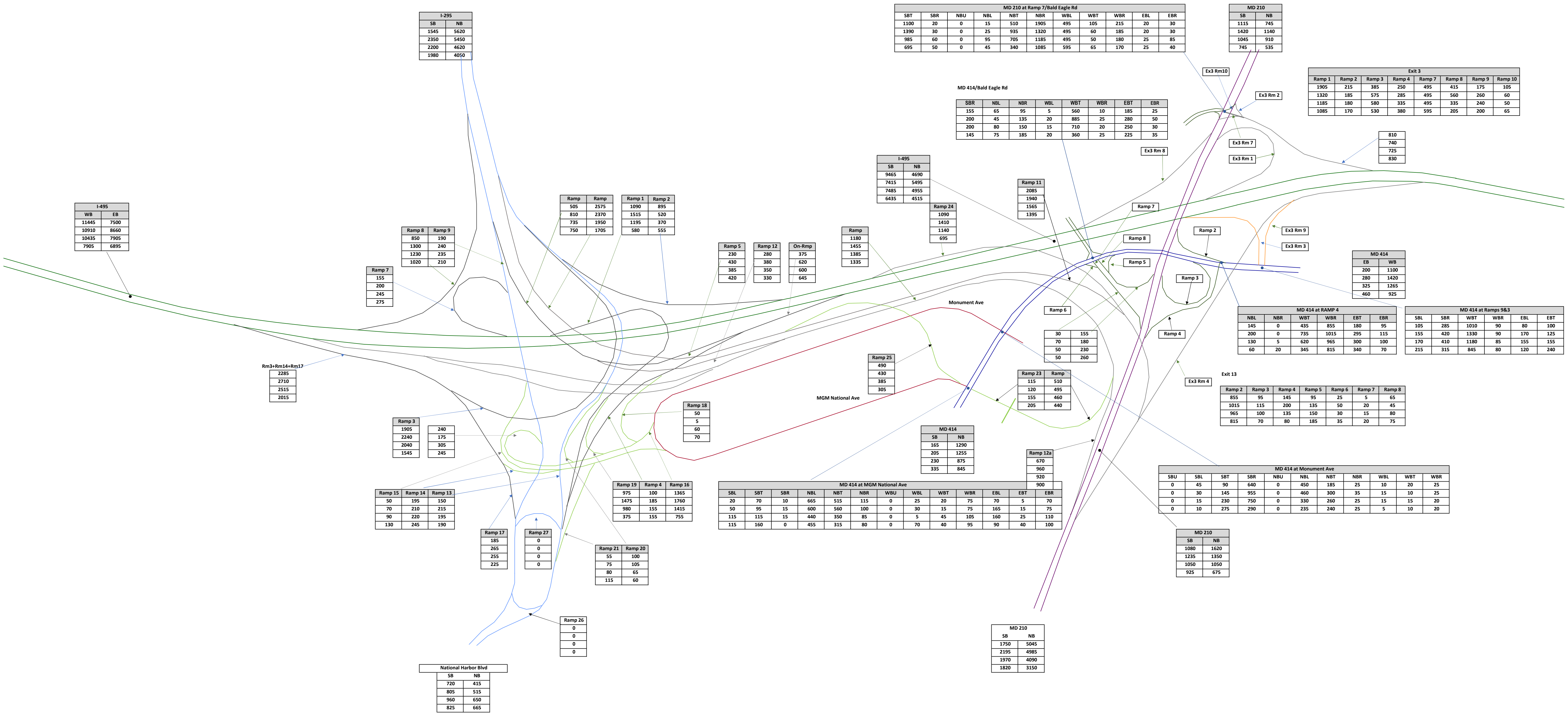
MD 414 at Alice Ave/Ramps 9&2								
SBL	SBR	NBL	NBT	NBR	WBT	WBR	EBL	EBT
80	140	75	5	230	800	25	35	1360
150	150	190	5	250	1180	50	35	1795
90	110	165	40	265	1135	50	40	1250
50	80	70	45	240	1175	30	60	1170

MD 414	
WB	EB
780	305
1290	645
1135	360
1170	635

MD 414 at John Hansen Ln					
NBL	NBR	WBL	WBT	EBT	EBR
210	550	100	565	305	0
380	585	155	910	640	0
325	600	290	810	360	0
255	285	215	915	635	0

MD 414 at RPMp 6/Spur from Brinkley Rd							
SBL	SBT	SBR	NBR	WBL	WBT	EBT	EBR
45	115	10	1455	150	660	855	0
50	120	30	1440	150	1040	1220	5
35	115	25	1100	200	1070	960	5
35	110	35	855	180	1095	915	5

I-495 South Side AM
Future Preferred Alternative Peak Period Volumes



MD 210 at Ramp 7/Bald Eagle Rd										
SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBR
1100	20	0	15	510	1905	495	105	215	20	30
1390	30	0	25	935	1320	495	60	185	20	30
985	60	0	95	705	1185	495	50	180	25	85
695	50	0	45	340	1085	595	65	170	25	40

MD 210	
SB	NB
1115	745
1420	1140
1045	910
745	535

I-295	
SB	NB
1545	5620
2350	5450
2200	4620
1980	4050

Exit 3							
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 7	Ramp 8	Ramp 9	Ramp 10
1905	215	385	250	495	415	175	105
1320	185	575	285	495	560	260	60
1185	180	580	335	495	335	240	50
1085	170	530	380	595	205	200	65

MD 414/Bald Eagle Rd

SBR	NBL	NBR	WBL	WBT	WBR	EBT	EBR
155	65	95	5	560	10	185	25
200	45	135	20	885	25	280	50
200	80	150	15	710	20	250	30
145	75	185	20	360	25	225	35

810
740
725
830

I-495	
SB	NB
9465	4690
7415	5495
7485	4955
6435	4515

Ramp 11
2085
1940
1565
1395

Ramp 24
1090
1410
1140
695

I-495	
WB	EB
11445	7500
10910	8660
10435	7905
7905	6895

Ramp 8	Ramp 9
850	190
1300	240
1230	235
1020	210

Ramp 7
155
200
245
275

Ramp	Ramp
505	2575
810	2370
735	1950
750	1705

Ramp 1	Ramp 2
1090	895
1515	520
1195	370
580	555

Ramp 5
230
430
385
420

Ramp 12
280
380
350
330

On-Rmp
375
620
600
645

Ramp
1180
1455
1385
1335

MD 414	
EB	WB
200	1100
280	1420
325	1265
460	925

MD 414 at RAMP 4					
NBL	NBR	WBT	WBR	EBT	EBR
145	0	435	855	180	95
200	0	735	1015	295	115
130	5	620	965	300	100
60	20	345	815	340	70

MD 414 at Ramps 9&3					
SBL	SBR	WBT	WBR	EBL	EBT
105	285	1010	90	80	100
155	420	1330	90	170	125
170	410	1180	85	155	155
215	315	845	80	120	240

30	155
70	180
50	230
50	260

Ramp 25
490
430
385
305

Ramp 23	Ramp
115	510
120	495
155	460
205	440

Exit 13

Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
855	95	145	95	25	5	65
1015	115	200	135	50	20	45
965	100	135	150	30	15	80
815	70	80	185	35	20	75

Rm3+Rm14+Rm17
2285
2710
2515
2015

Ramp 18
50
5
60
70

Ramp 3
1905
2240
2040
1545

240
175
305
245

MD 414	
SB	NB
165	1290
205	1255
230	875
335	845

Ramp 12a
670
960
920
900

MD 414 at Monument Ave										
SBU	SBL	SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR
0	45	90	640	0	450	185	25	10	20	25
0	30	145	955	0	460	300	35	15	10	25
0	15	230	750	0	330	260	25	15	15	20
0	10	275	290	0	235	240	25	5	10	20

Ramp 15	Ramp 14	Ramp 13
50	195	150
70	210	215
90	220	195
130	245	190

Ramp 19	Ramp 4	Ramp 16
975	100	1365
1475	185	1760
980	155	1415
375	155	755

MD 414 at MGM National Ave												
SBL	SBT	SBR	NBL	NBT	NBR	WBU	WBL	WBT	WBR	EBL	EBT	EBR
20	70	10	665	515	115	0	25	20	75	70	5	70
50	95	15	600	560	100	0	30	15	75	165	15	75
115	115	15	440	350	85	0	5	45	105	160	25	110
115	160	0	455	315	80	0	70	40	95	90	40	100

MD 210	
SB	NB
1080	1620
1235	1350
1050	1050
925	675

Ramp 17
185
265
255
225

Ramp 27
0
0
0
0

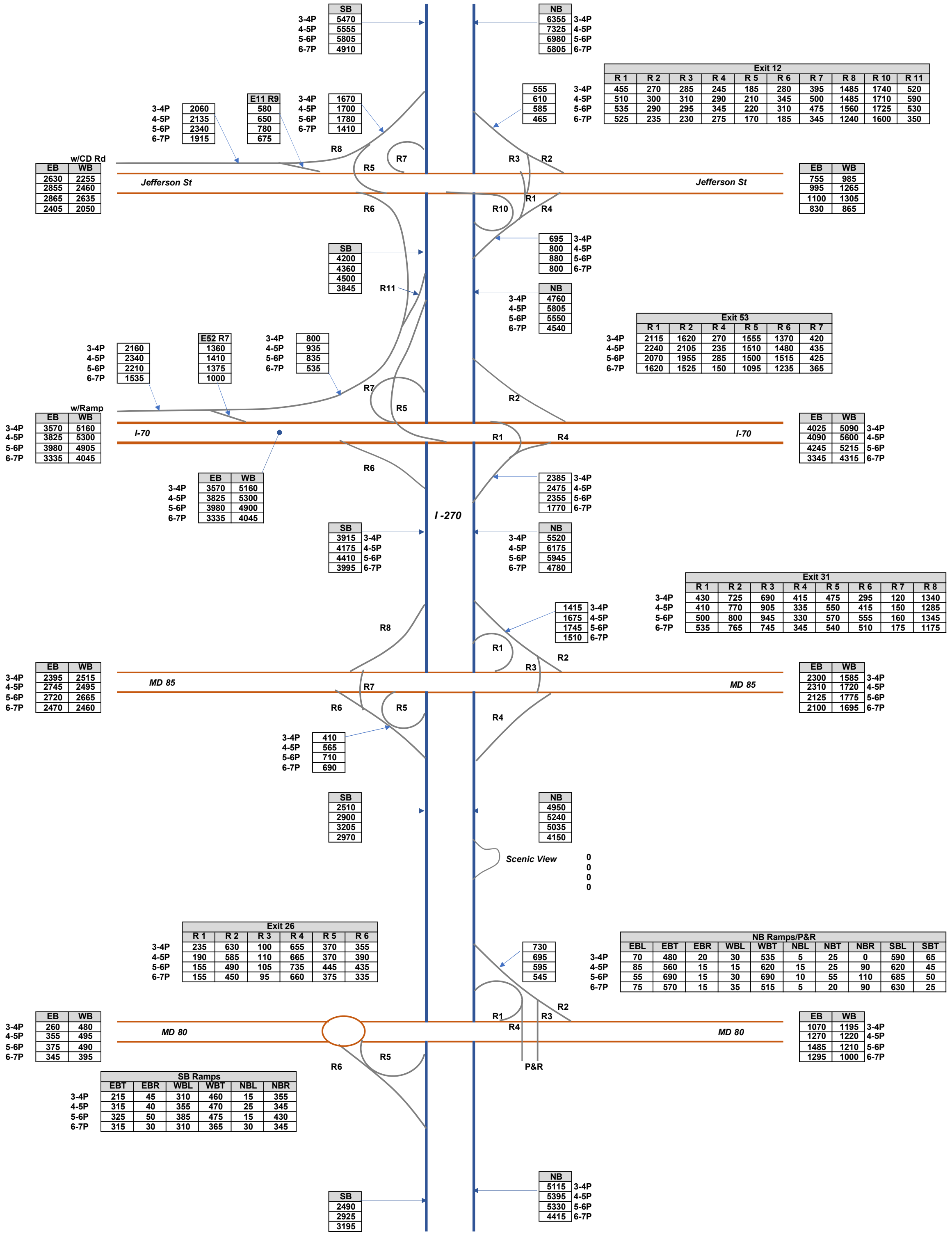
Ramp 21	Ramp 20
55	100
75	105
80	65
115	60

Ramp 26
0
0
0
0

MD 210	
SB	NB
1750	5045
2195	4985
1970	4090
1820	3150

National Harbor Blvd	
SB	NB
720	415
805	515
960	650
825	665

I-270 & I-495 West Side PM
Future Preferred Alternative Peak Period Volumes



	SB
3-4P	5470
4-5P	5555
5-6P	5805
6-7P	4910

NB	
6355	3-4P
7325	4-5P
6980	5-6P
5805	6-7P

3-4P	2060
4-5P	2135
5-6P	2340
6-7P	1915

E11 R9
580
650
780
675

3-4P	1670
4-5P	1700
5-6P	1780
6-7P	1410

555		3-4P
610		4-5P
585		5-6P
465		6-7P

	Exit 12									
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 10	R 11
3-4P	455	270	285	245	185	280	395	1485	1740	520
4-5P	510	300	310	290	210	345	500	1485	1710	590
5-6P	535	290	295	345	220	310	475	1560	1725	530
6-7P	525	235	230	275	170	185	345	1240	1600	350

w/CD Rd

EB	WB
2630	2255
2855	2460
2865	2635
2405	2050

EB	WB
755	985
995	1265
1100	1305
830	865

695	3-4P
800	4-5P
880	5-6P
800	6-7P

SB
4200
4360
4500
3845

	NB
3-4P	4760
4-5P	5805
5-6P	5550
6-7P	4540

	Exit 53					
	R 1	R 2	R 4	R 5	R 6	R 7
3-4P	2115	1620	270	1555	1370	420
4-5P	2240	2105	235	1510	1480	435
5-6P	2070	1955	285	1500	1515	425
6-7P	1620	1525	150	1095	1235	365

3-4P	2160
4-5P	2340
5-6P	2210
6-7P	1535

E52 R7
1360
1410
1375
1000

3-4P	800
4-5P	935
5-6P	835
6-7P	535

w/Ramp

	EB	WB
3-4P	3570	5160
4-5P	3825	5300
5-6P	3980	4905
6-7P	3335	4045

EB	WB	
4025	5090	3-4P
4090	5600	4-5P
4245	5215	5-6P
3345	4315	6-7P

	EB	WB
3-4P	3570	5160
4-5P	3825	5300
5-6P	3980	4900
6-7P	3335	4045

2385	3-4P
2475	4-5P
2355	5-6P
1770	6-7P

SB	
3915	3-4P
4175	4-5P
4410	5-6P
3995	6-7P

	NB
3-4P	5520
4-5P	6175
5-6P	5945
6-7P	4780

	Exit 31							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	430	725	690	415	475	295	120	1340
4-5P	410	770	905	335	550	415	150	1285
5-6P	500	800	945	330	570	555	160	1345
6-7P	535	765	745	345	540	510	175	1175

1415	3-4P
1675	4-5P
1745	5-6P
1510	6-7P

	EB	WB
3-4P	2395	2515
4-5P	2745	2495
5-6P	2720	2665
6-7P	2470	2460

EB	WB	
2300	1585	3-4P
2310	1720	4-5P
2125	1775	5-6P
2100	1695	6-7P

3-4P	410
4-5P	565
5-6P	710
6-7P	690

SB
2510
2900
3205
2970

NB
4950
5240
5035
4150

Scenic View

0
0
0
0

	Exit 26					
	R 1	R 2	R 3	R 4	R 5	R 6
3-4P	235	630	100	655	370	355
4-5P	190	585	110	665	370	390
5-6P	155	490	105	735	445	435
6-7P	155	450	95	660	375	335

730
695
595
545

	NB Ramps/P&R									
	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
3-4P	70	480	20	30	535	5	25	0	590	65
4-5P	85	560	15	15	620	15	25	90	620	45
5-6P	55	690	15	30	690	10	55	110	685	50
6-7P	75	570	15	35	515	5	20	90	630	25

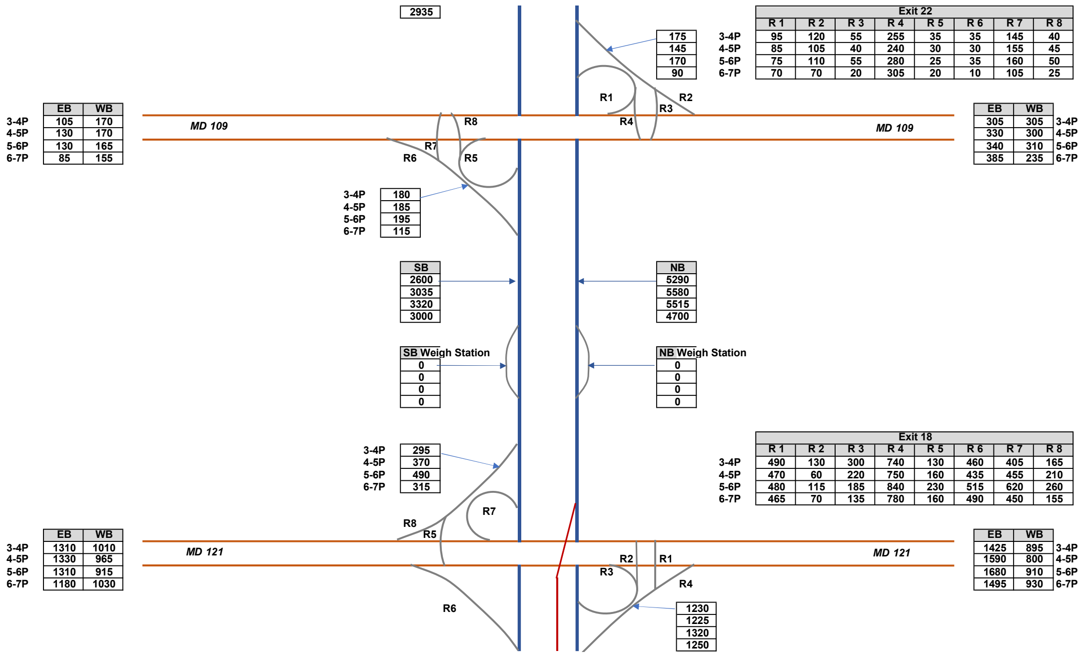
	EB	WB
3-4P	260	480
4-5P	355	495
5-6P	375	490
6-7P	345	395

EB	WB	
1070	1195	3-4P
1270	1220	4-5P
1485	1210	5-6P
1295	1000	6-7P

	SB Ramps					
	EBT	EBR	WBL	WBT	NBL	NBR
3-4P	215	45	310	460	15	355
4-5P	315	40	355	470	25	345
5-6P	325	50	385	475	15	430
6-7P	315	30	310	365	30	345

NB	
5115	3-4P
5395	4-5P
5330	5-6P
4415	6-7P

SB
2490
2925
3195



2935

Exit 22	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	95	120	55	255	35	35	145	40
4-5P	85	105	40	240	30	30	155	45
5-6P	75	110	55	280	25	35	160	50
6-7P	70	70	20	305	20	10	105	25

3-4P	175
4-5P	145
5-6P	170
6-7P	90

MD 109

	EB	WB
3-4P	105	170
4-5P	130	170
5-6P	130	165
6-7P	85	155

	EB	WB
3-4P	305	305
4-5P	330	300
5-6P	340	310
6-7P	385	235

3-4P	180
4-5P	185
5-6P	195
6-7P	115

SB	NB
2600	5290
3035	5580
3320	5515
3000	4700

SB Weigh Station	NB Weigh Station
0	0
0	0
0	0
0	0

3-4P	295
4-5P	370
5-6P	490
6-7P	315

Exit 18	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	490	130	300	740	130	460	405	165
4-5P	470	60	220	750	160	435	455	210
5-6P	480	115	185	840	230	515	620	260
6-7P	465	70	135	780	160	490	450	155

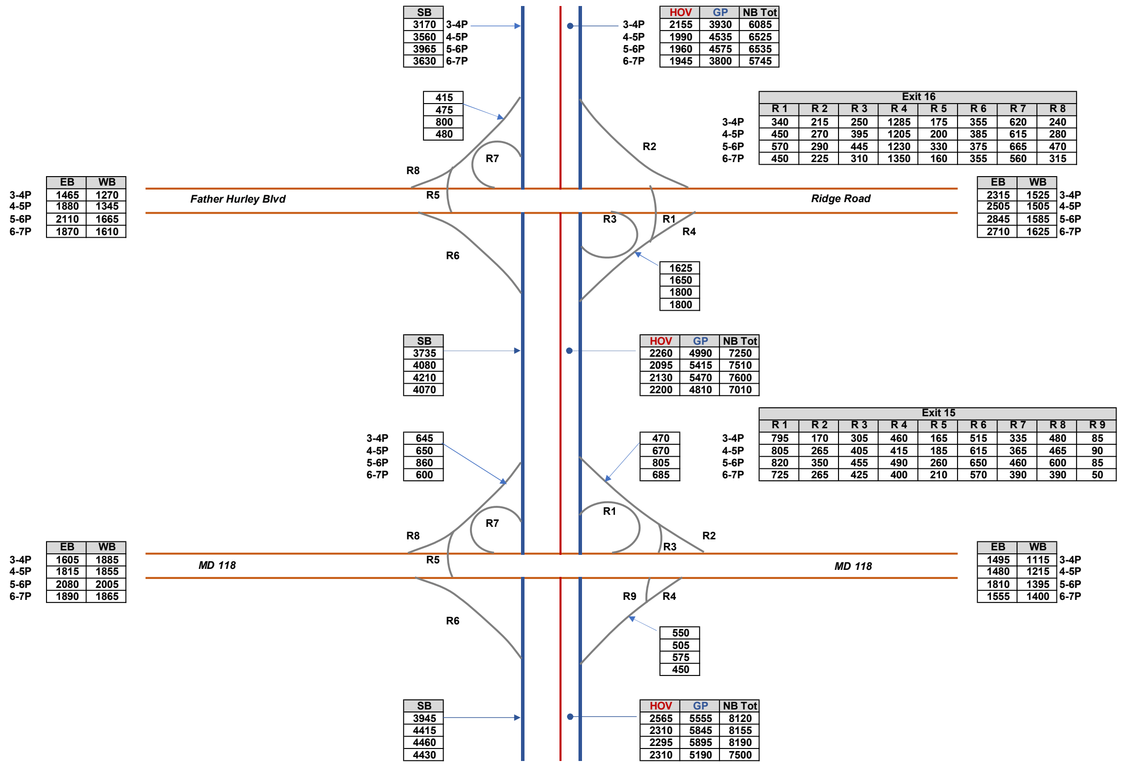
MD 121

	EB	WB
3-4P	1310	1010
4-5P	1330	965
5-6P	1310	915
6-7P	1180	1030

	EB	WB
3-4P	1425	895
4-5P	1590	800
5-6P	1680	910
6-7P	1495	930

1230
1225
1320
1250

I-270 & I-495 West Side PM
Future Preferred Alternative Peak Period Volumes



SB	
3170	3-4P
3560	4-5P
3965	5-6P
3630	6-7P

	HOV	GP	NB Tot
3-4P	2155	3930	6085
4-5P	1990	4535	6525
5-6P	1960	4575	6535
6-7P	1945	3800	5745

415
475
800
480

	Exit 16							
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
3-4P	340	215	250	1285	175	355	620	240
4-5P	450	270	395	1205	200	385	615	280
5-6P	570	290	445	1230	330	375	665	470
6-7P	450	225	310	1350	160	355	560	315

	EB	WB
3-4P	1465	1270
4-5P	1880	1345
5-6P	2110	1665
6-7P	1870	1610

EB	WB	
2315	1525	3-4P
2505	1505	4-5P
2845	1585	5-6P
2710	1625	6-7P

1625
1650
1800
1800

SB
3735
4080
4210
4070

HOV	GP	NB Tot
2260	4990	7250
2095	5415	7510
2130	5470	7600
2200	4810	7010

	Exit 15								
	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9
3-4P	795	170	305	460	165	515	335	480	85
4-5P	805	265	405	415	185	615	365	465	90
5-6P	820	350	455	490	260	650	460	600	85
6-7P	725	265	425	400	210	570	390	390	50

3-4P	645
4-5P	650
5-6P	860
6-7P	600

470
670
805
685

	EB	WB
3-4P	1605	1885
4-5P	1815	1855
5-6P	2080	2005
6-7P	1890	1865

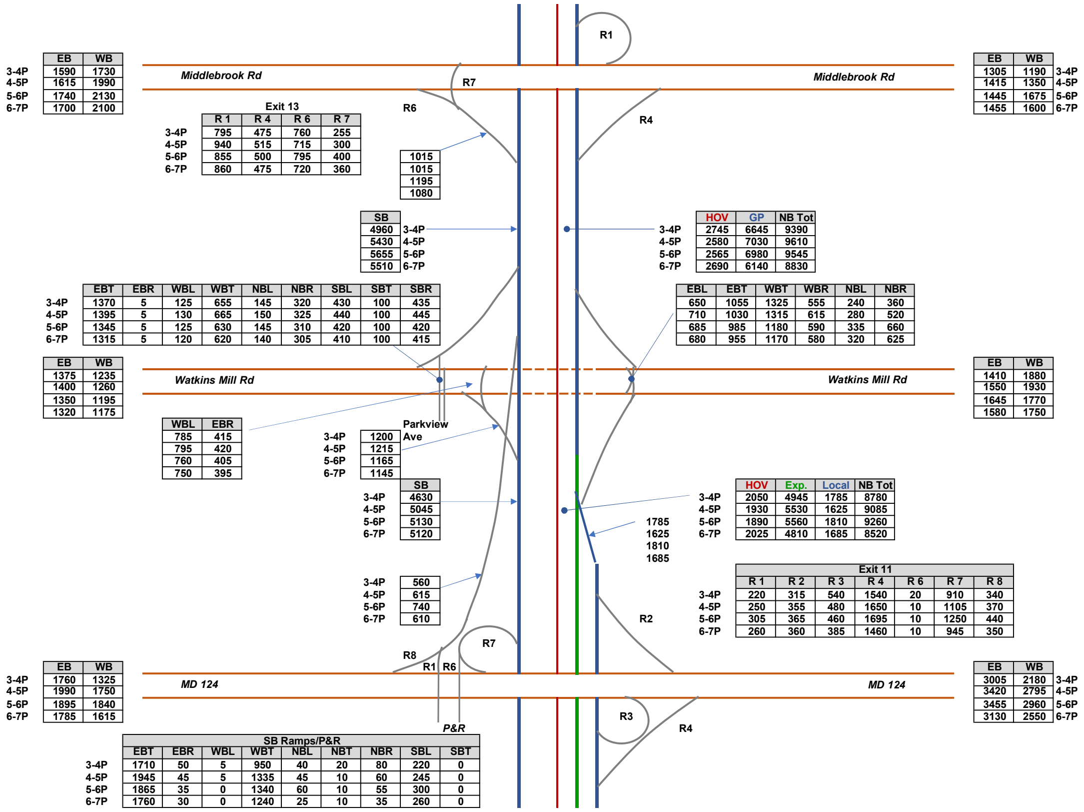
EB	WB	
1495	1115	3-4P
1480	1215	4-5P
1810	1395	5-6P
1555	1400	6-7P

550
505
575
450

SB
3945
4415
4460
4430

HOV	GP	NB Tot
2565	5555	8120
2310	5845	8155
2295	5895	8190
2310	5190	7500

I-270 & I-495 West Side PM
Future Preferred Alternative Peak Period Volumes



Middlebrook Rd (west)

	EB	WB
3-4P	1590	1730
4-5P	1615	1990
5-6P	1740	2130
6-7P	1700	2100

Middlebrook Rd (east)

EB	WB	
1305	1190	3-4P
1415	1350	4-5P
1445	1675	5-6P
1455	1600	6-7P

Exit 13

	R 1	R 4	R 6	R 7
3-4P	795	475	760	255
4-5P	940	515	715	300
5-6P	855	500	795	400
6-7P	860	475	720	360

1015
1015
1195
1080

SB	
4960	3-4P
5430	4-5P
5655	5-6P
5510	6-7P

	HOV	GP	NB Tot
3-4P	2745	6645	9390
4-5P	2580	7030	9610
5-6P	2565	6980	9545
6-7P	2690	6140	8830

	EBT	EBR	WBL	WBT	NBL	NBR	SBL	SBT	SBR
3-4P	1370	5	125	655	145	320	430	100	435
4-5P	1395	5	130	665	150	325	440	100	445
5-6P	1345	5	125	630	145	310	420	100	420
6-7P	1315	5	120	620	140	305	410	100	415

EBL	EBT	WBT	WBR	NBL	NBR
650	1055	1325	555	240	360
710	1030	1315	615	280	520
685	985	1180	590	335	660
680	955	1170	580	320	625

Watkins Mill Rd (west)

EB	WB
1375	1235
1400	1260
1350	1195
1320	1175

Watkins Mill Rd (east)

EB	WB
1410	1880
1550	1930
1645	1770
1580	1750

WBL	EBR
785	415
795	420
760	405
750	395

Parkview Ave

3-4P	1200
4-5P	1215
5-6P	1165
6-7P	1145

	SB
3-4P	4630
4-5P	5045
5-6P	5130
6-7P	5120

	HOV	Exp.	Local	NB Tot
3-4P	2050	4945	1785	8780
4-5P	1930	5530	1625	9085
5-6P	1890	5560	1810	9260
6-7P	2025	4810	1685	8520

1785
1625
1810
1685

3-4P	560
4-5P	615
5-6P	740
6-7P	610

Exit 11

	R 1	R 2	R 3	R 4	R 6	R 7	R 8
3-4P	220	315	540	1540	20	910	340
4-5P	250	355	480	1650	10	1105	370
5-6P	305	365	460	1695	10	1250	440
6-7P	260	360	385	1460	10	945	350

MD 124 (west)

	EB	WB
3-4P	1760	1325
4-5P	1990	1750
5-6P	1895	1840
6-7P	1785	1615

MD 124 (east)

EB	WB	
3005	2180	3-4P
3420	2795	4-5P
3455	2960	5-6P
3130	2550	6-7P

SB Ramps/P&R

	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
3-4P	1710	50	5	950	40	20	80	220	0
4-5P	1945	45	5	1335	45	10	60	245	0
5-6P	1865	35	0	1340	60	10	55	300	0
6-7P	1760	30	0	1240	25	10	35	260	0

I-270 & I-495 West Side PM
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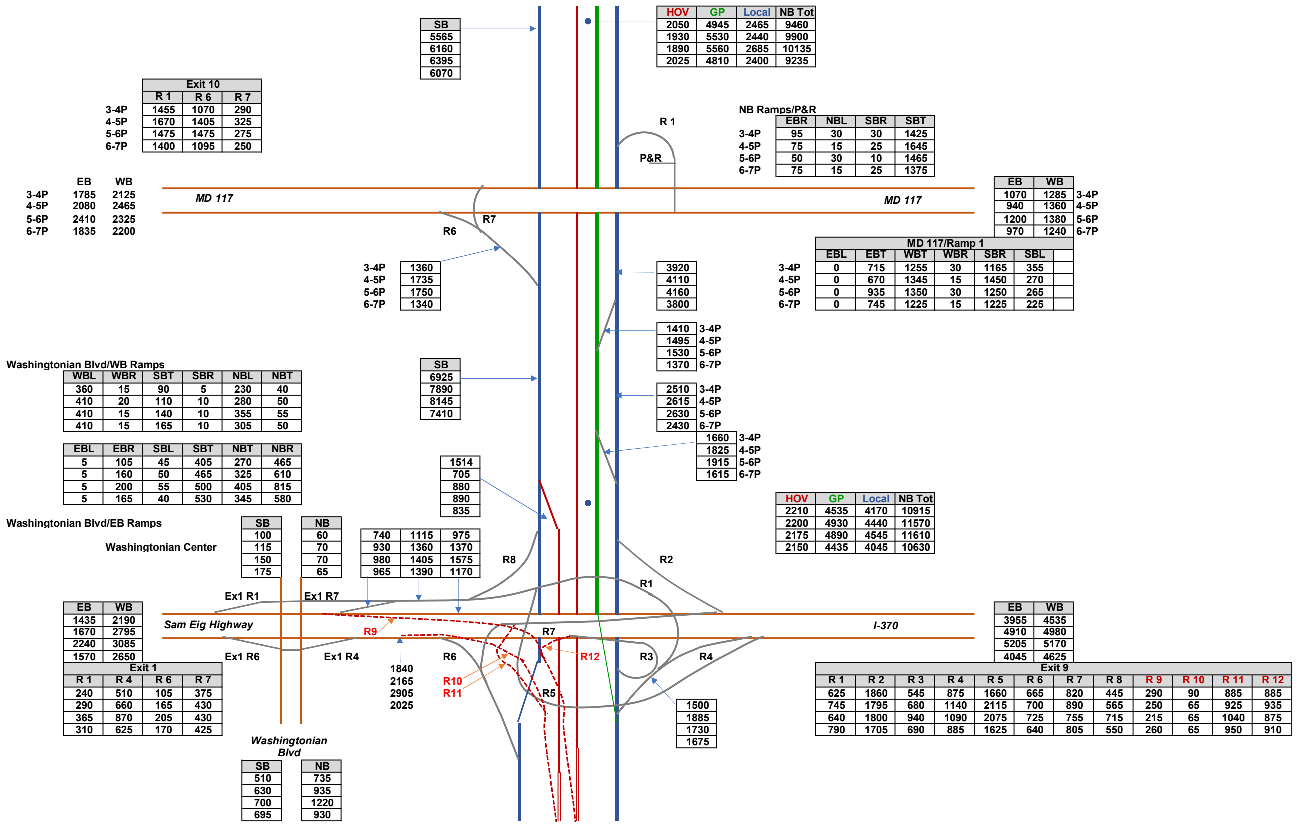


SB
5565
6160
6395
6070

HOV	GP	Local	NB Tot
2050	4945	2465	9460
1930	5530	2440	9900
1890	5560	2685	10135
2025	4810	2400	9235

	Exit 10		
	R 1	R 6	R 7
3-4P	1455	1070	290
4-5P	1670	1405	325
5-6P	1475	1475	275
6-7P	1400	1095	250

NB Ramps/P&R

	EBR	NBL	SBR	SBT
3-4P	95	30	30	1425
4-5P	75	15	25	1645
5-6P	50	30	10	1465
6-7P	75	15	25	1375

	EB	WB
3-4P	1785	2125
4-5P	2080	2465
5-6P	2410	2325
6-7P	1835	2200

EB	WB	
1070	1285	3-4P
940	1360	4-5P
1200	1380	5-6P
970	1240	6-7P

	MD 117/Ramp 1						
	EBL	EBT	WBT	WBR	SBR	SBL	
3-4P	0	715	1255	30	1165	355	
4-5P	0	670	1345	15	1450	270	
5-6P	0	935	1350	30	1250	265	
6-7P	0	745	1225	15	1225	225	

3-4P	1360
4-5P	1735
5-6P	1750
6-7P	1340

3920
4110
4160
3800

1410	3-4P
1495	4-5P
1530	5-6P
1370	6-7P

Washingtonian Blvd/WB Ramps

WBL	WBR	SBT	SBR	NBL	NBT
360	15	90	5	230	40
410	20	110	10	280	50
410	15	140	10	355	55
410	15	165	10	305	50

SB
6925
7890
8145
7410

2510	3-4P
2615	4-5P
2630	5-6P
2430	6-7P

1660	3-4P
1825	4-5P
1915	5-6P
1615	6-7P

EBL	EBR	SBL	SBT	NBT	NBR
5	105	45	405	270	465
5	160	50	465	325	610
5	200	55	500	405	815
5	165	40	530	345	580

1514
705
880
890
835

HOV	GP	Local	NB Tot
2210	4535	4170	10915
2200	4930	4440	11570
2175	4890	4545	11610
2150	4435	4045	10630

Washingtonian Blvd/EB Ramps

Washingtonian Center

SB
100
115
150
175

NB
60
70
70
65

740	1115	975
930	1360	1370
980	1405	1575
965	1390	1170

EB	WB
1435	2190
1670	2795
2240	3085
1570	2650

Exit 1			
R 1	R 4	R 6	R 7
240	510	105	375
290	660	165	430
365	870	205	430
310	625	170	425

1840
2165
2905
2025

EB	WB
3955	4535
4910	4980
5205	5170
4045	4625

Exit 9											
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12
625	1860	545	875	1660	665	820	445	290	90	885	885
745	1795	680	1140	2115	700	890	565	250	65	925	935
640	1800	940	1090	2075	725	755	715	215	65	1040	875
790	1705	690	885	1625	640	805	550	260	65	950	910

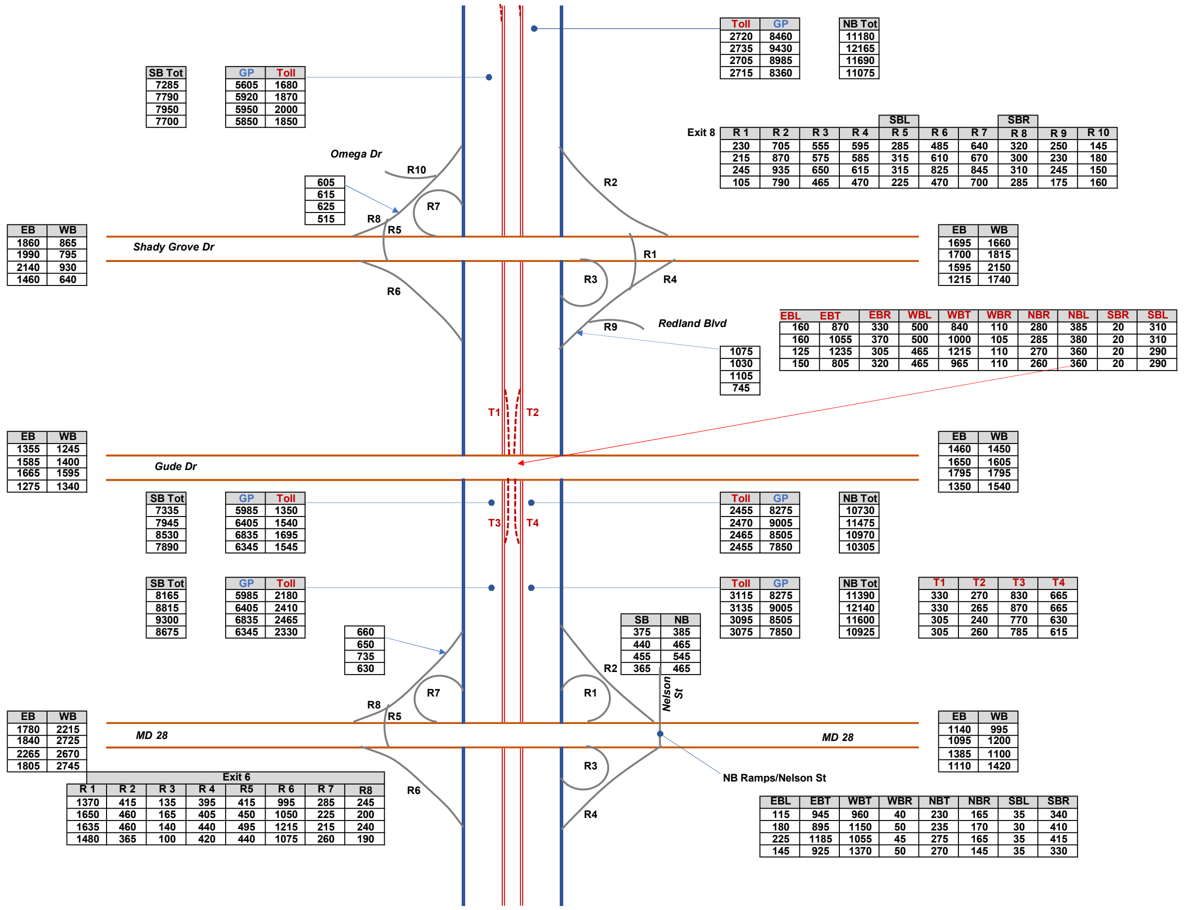
1500
1885
1730
1675

Washingtonian Blvd

SB
510
630
700
695

NB
735
935
1220
930

I-270 & I-495 West Side PM
Future Preferred Alternative Peak Period Volumes



SB Tot
7285
7790
7950
7700

GP	Toll
5605	1680
5920	1870
5950	2000
5850	1850

Toll	GP
2720	8460
2735	9430
2705	8985
2715	8360

NB Tot
11180
12165
11690
11075

Exit 8

				SBL			SBR		
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10
230	705	555	595	285	485	640	320	250	145
215	870	575	585	315	610	670	300	230	180
245	935	650	615	315	825	845	310	245	150
105	790	465	470	225	470	700	285	175	160

605
615
625
515

EB	WB
1860	865
1990	795
2140	930
1460	640

EB	WB
1695	1660
1700	1815
1595	2150
1215	1740

EBL	EBT	EBR	WBL	WBT	WBR	NBR	NBL	SBR	SBL
160	870	330	500	840	110	280	385	20	310
160	1055	370	500	1000	105	285	380	20	310
125	1235	305	465	1215	110	270	360	20	290
150	805	320	465	965	110	260	360	20	290

1075
1030
1105
745

EB	WB
1355	1245
1585	1400
1665	1595
1275	1340

EB	WB
1460	1450
1650	1605
1795	1795
1350	1540

SB Tot
7335
7945
8530
7890

GP	Toll
5985	1350
6405	1540
6835	1695
6345	1545

Toll	GP
2455	8275
2470	9005
2465	8505
2455	7850

NB Tot
10730
11475
10970
10305

SB Tot
8165
8815
9300
8675

GP	Toll
5985	2180
6405	2410
6835	2465
6345	2330

Toll	GP
3115	8275
3135	9005
3095	8505
3075	7850

NB Tot
11390
12140
11600
10925

T1	T2	T3	T4
330	270	830	665
330	265	870	665
305	240	770	630
305	260	785	615

660
650
735
630

SB	NB
375	385
440	465
455	545
365	465

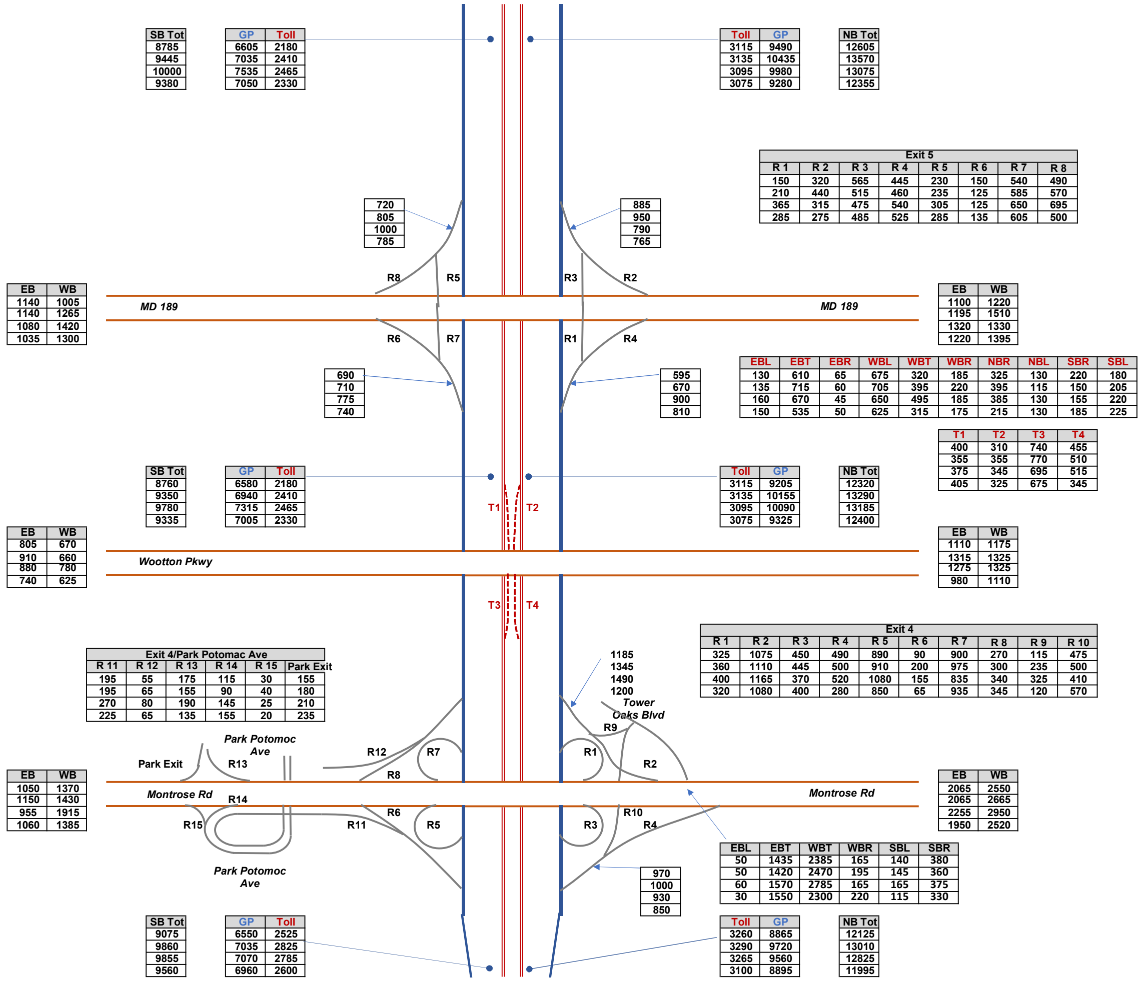
EB	WB
1780	2215
1840	2725
2265	2670
1805	2745

EB	WB
1140	995
1095	1200
1385	1100
1110	1420

Exit 6							
R 1	R 2	R 3	R 4	R5	R 6	R 7	R8
1370	415	135	395	415	995	285	245
1650	460	165	405	450	1050	225	200
1635	460	140	440	495	1215	215	240
1480	365	100	420	440	1075	260	190

EBL	EBT	WBT	WBR	NBT	NBR	SBL	SBR
115	945	960	40	230	165	35	340
180	895	1150	50	235	170	30	410
225	1185	1055	45	275	165	35	415
145	925	1370	50	270	145	35	330

I-270 & I-495 West Side PM
Future Preferred Alternative Peak Period Volumes



SB Tot
8785
9445
10000
9380

GP	Toll
6605	2180
7035	2410
7535	2465
7050	2330

Toll	GP
3115	9490
3135	10435
3095	9980
3075	9280

NB Tot
12605
13570
13075
12355

Exit 5							
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
150	320	565	445	230	150	540	490
210	440	515	460	235	125	585	570
365	315	475	540	305	125	650	695
285	275	485	525	285	135	605	500

720
805
1000
785

885
950
790
765

EB	WB
1140	1005
1140	1265
1080	1420
1035	1300

EB	WB
1100	1220
1195	1510
1320	1330
1220	1395

690
710
775
740

595
670
900
810

EBL	EBT	EBR	WBL	WBT	WBR	NBR	NBL	SBR	SBL
130	610	65	675	320	185	325	130	220	180
135	715	60	705	395	220	395	115	150	205
160	670	45	650	495	185	385	130	155	220
150	535	50	625	315	175	215	130	185	225

T1	T2	T3	T4
400	310	740	455
355	355	770	510
375	345	695	515
405	325	675	345

SB Tot
8760
9350
9780
9335

GP	Toll
6580	2180
6940	2410
7315	2465
7005	2330

Toll	GP
3115	9205
3135	10155
3095	10090
3075	9325

NB Tot
12320
13290
13185
12400

EB	WB
805	670
910	660
880	780
740	625

EB	WB
1110	1175
1315	1325
1275	1325
980	1110

Exit 4									
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10
325	1075	450	490	890	90	900	270	115	475
360	1110	445	500	910	200	975	300	235	500
400	1165	370	520	1080	155	835	340	325	410
320	1080	400	280	850	65	935	345	120	570

Exit 4/Park Potomac Ave					
R 11	R 12	R 13	R 14	R 15	Park Exit
195	55	175	115	30	155
195	65	155	90	40	180
270	80	190	145	25	210
225	65	135	155	20	235

1185
1345
1490
1200

EB	WB
1050	1370
1150	1430
955	1915
1060	1385

EB	WB
2065	2550
2065	2665
2255	2950
1950	2520

EBL	EBT	WBT	WBR	SBL	SBR
50	1435	2385	165	140	380
50	1420	2470	195	145	360
60	1570	2785	165	165	375
30	1550	2300	220	115	330

970
1000
930
850

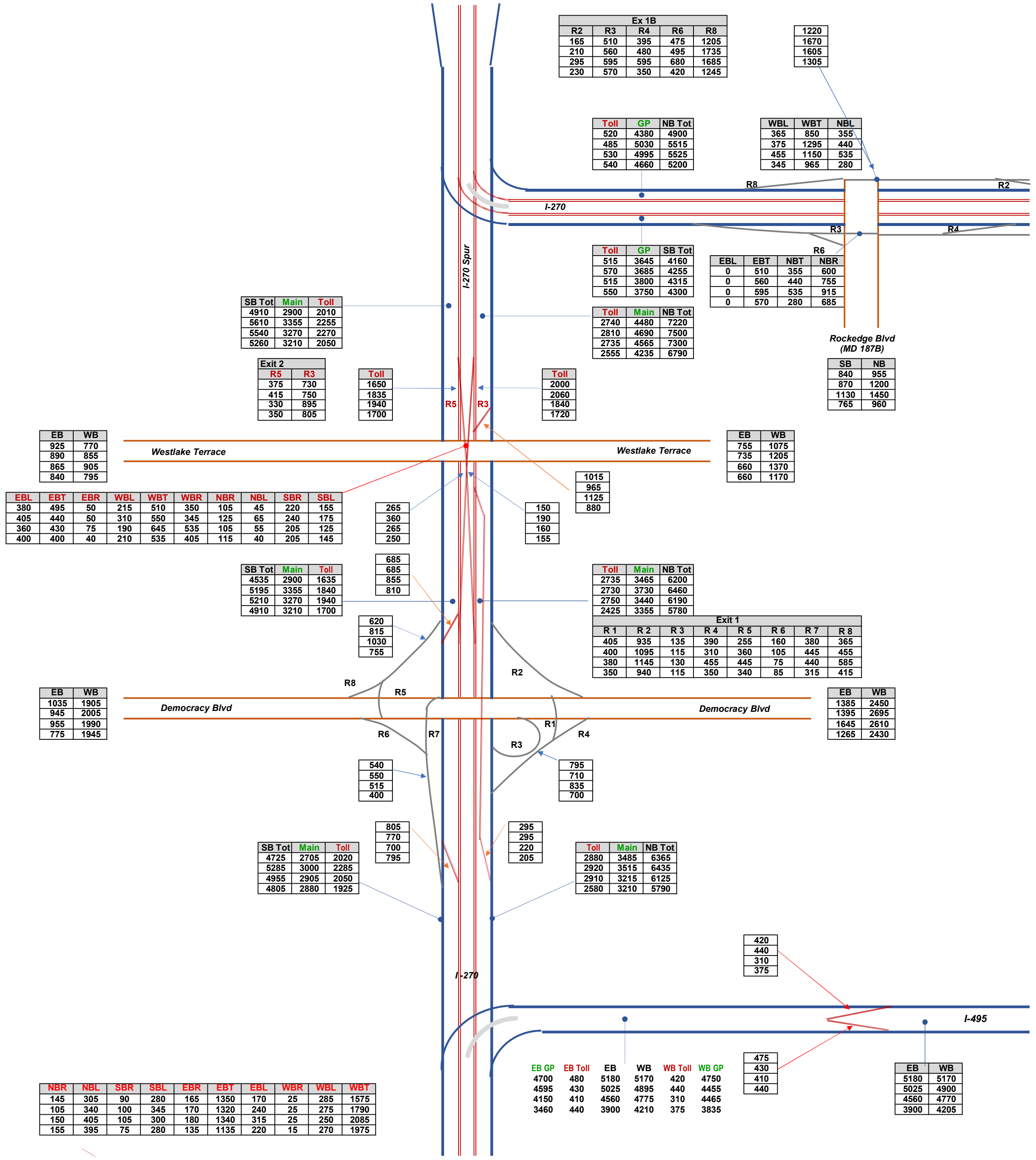
SB Tot
9075
9860
9855
9560

GP	Toll
6550	2525
7035	2825
7070	2785
6960	2600

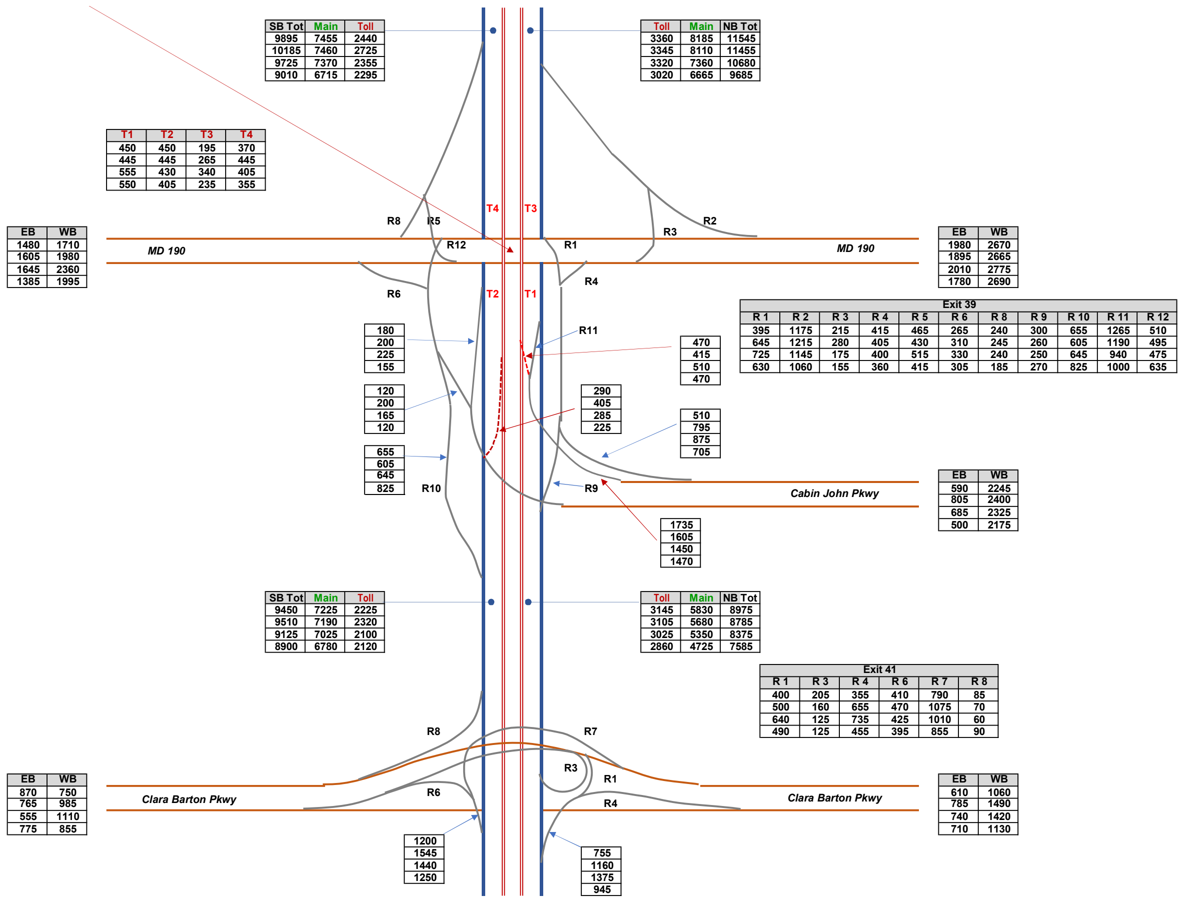
Toll	GP
3260	8865
3290	9720
3265	9560
3100	8895

NB Tot
12125
13010
12825
11995

I-270 & I-495 West Side PM
Future Preferred Alternative Peak Period Volumes



I-270 & I-495 West Side PM
Future Preferred Alternative Peak Period Volumes



SB Tot	Main	Toll
9895	7455	2440
10185	7460	2725
9725	7370	2355
9010	6715	2295

Toll	Main	NB Tot
3360	8185	11545
3345	8110	11455
3320	7360	10680
3020	6665	9685

T1	T2	T3	T4
450	450	195	370
445	445	265	445
555	430	340	405
550	405	235	355

EB	WB
1480	1710
1605	1980
1645	2360
1385	1995

EB	WB
1980	2670
1895	2665
2010	2775
1780	2690

Exit 39										
R 1	R 2	R 3	R 4	R 5	R 6	R 8	R 9	R 10	R 11	R 12
395	1175	215	415	465	265	240	300	655	1265	510
645	1215	280	405	430	310	245	260	605	1190	495
725	1145	175	400	515	330	240	250	645	940	475
630	1060	155	360	415	305	185	270	825	1000	635

180
200
225
155

470
415
510
470

120
200
165
120

290
405
285
225

510
795
875
705

655
605
645
825

EB	WB
590	2245
805	2400
685	2325
500	2175

1735
1605
1450
1470

SB Tot	Main	Toll
9450	7225	2225
9510	7190	2320
9125	7025	2100
8900	6780	2120

Toll	Main	NB Tot
3145	5830	8975
3105	5680	8785
3025	5350	8375
2860	4725	7585

Exit 41					
R 1	R 3	R 4	R 6	R 7	R 8
400	205	355	410	790	85
500	160	655	470	1075	70
640	125	735	425	1010	60
490	125	455	395	855	90

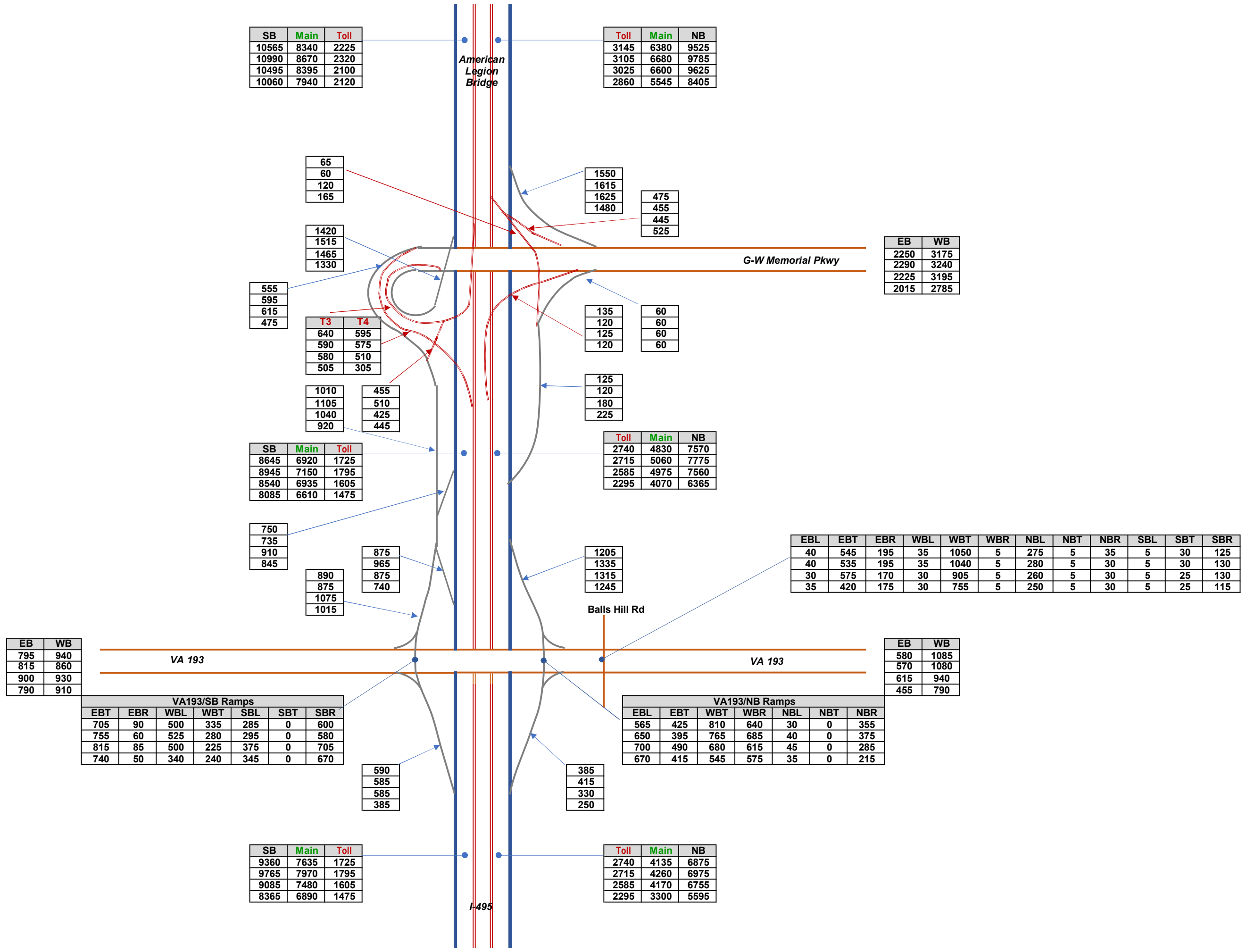
EB	WB
870	750
765	985
555	1110
775	855

EB	WB
610	1060
785	1490
740	1420
710	1130

1200
1545
1440
1250

755
1160
1375
945

I-270 & I-495 West Side PM
Future Preferred Alternative Peak Period Volumes



SB	Main	Toll
10565	8340	2225
10990	8670	2320
10495	8395	2100
10060	7940	2120

Toll	Main	NB
3145	6380	9525
3105	6680	9785
3025	6600	9625
2860	5545	8405

65
60
120
165

1550
1615
1625
1480

475
455
445
525

1420
1515
1465
1330

EB	WB
2250	3175
2290	3240
2225	3195
2015	2785

555
595
615
475

T3	T4
640	595
590	575
580	510
505	305

135
120
125
120

60
60
60
60

125
120
180
225

1010
1105
1040
920

455
510
425
445

SB	Main	Toll
8645	6920	1725
8945	7150	1795
8540	6935	1605
8085	6610	1475

Toll	Main	NB
2740	4830	7570
2715	5060	7775
2585	4975	7560
2295	4070	6365

750
735
910
845

875
965
875
740

890
875
1075
1015

1205
1335
1315
1245

EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
40	545	195	35	1050	5	275	5	35	5	30	125
40	535	195	35	1040	5	280	5	30	5	30	130
30	575	170	30	905	5	260	5	30	5	25	130
35	420	175	30	755	5	250	5	30	5	25	115

EB	WB
795	940
815	860
900	930
790	910

EB	WB
580	1085
570	1080
615	940
455	790

VA193/SB Ramps						
EBT	EBR	WBL	WBT	SBL	SBT	SBR
705	90	500	335	285	0	600
755	60	525	280	295	0	580
815	85	500	225	375	0	705
740	50	340	240	345	0	670

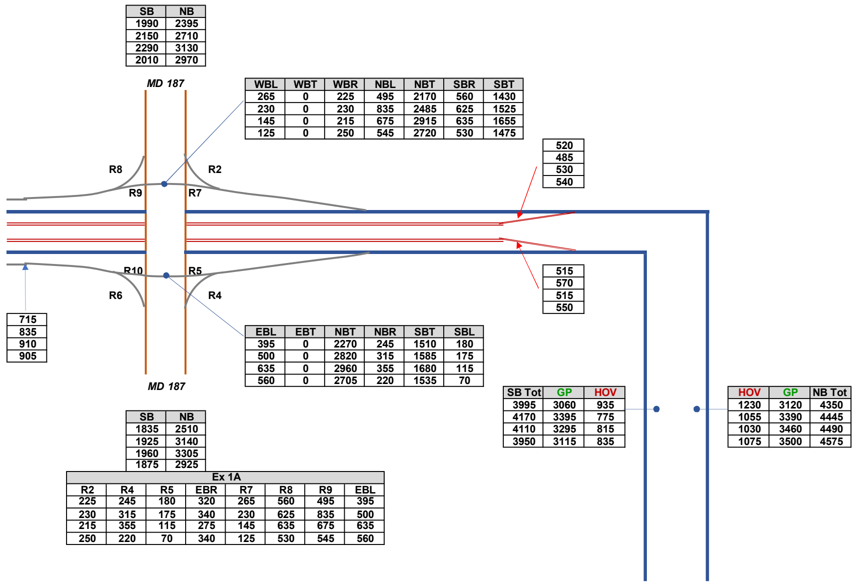
VA193/NB Ramps						
EBL	EBT	WBT	WBR	NBL	NBT	NBR
565	425	810	640	30	0	355
650	395	765	685	40	0	375
700	490	680	615	45	0	285
670	415	545	575	35	0	215

590
585
585
385

385
415
330
250

SB	Main	Toll
9360	7635	1725
9765	7970	1795
9085	7480	1605
8365	6890	1475

Toll	Main	NB
2740	4135	6875
2715	4260	6975
2585	4170	6755
2295	3300	5595



SB	NB
1990	2395
2150	2710
2290	3130
2010	2970

WBL	WBT	WBR	NBL	NBT	SBR	SBT
265	0	225	495	2170	560	1430
230	0	230	835	2485	625	1525
145	0	215	675	2915	635	1655
125	0	250	545	2720	530	1475

520
485
530
540

515
570
515
550

715
835
910
905

EBL	EBT	NBT	NBR	SBT	SBL
395	0	2270	245	1510	180
500	0	2820	315	1585	175
635	0	2960	355	1680	115
560	0	2705	220	1535	70

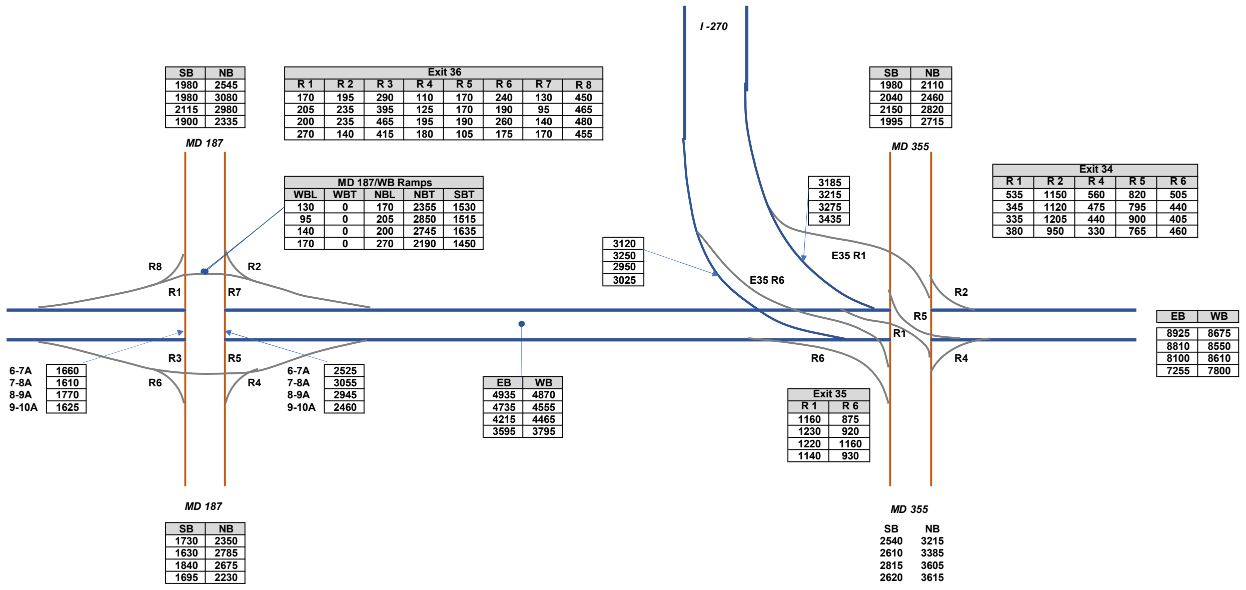
SB Tot	GP	HOV
3995	3060	935
4170	3395	775
4110	3295	815
3950	3115	835

HOV	GP	NB Tot
1230	3120	4350
1055	3390	4445
1030	3460	4490
1075	3500	4575

SB	NB
1835	2510
1925	3140
1960	3305
1875	2925

Ex 1A							
R2	R4	R5	EBR	R7	R8	R9	EBL
225	245	180	320	265	560	495	395
230	315	175	340	230	625	835	500
215	355	115	275	145	635	675	635
250	220	70	340	125	530	545	560

I-270 & I-495 West Side PM
Future Preferred Alternative Peak Period Volumes



MD 187 (north)

SB	NB
1980	2545
1980	3080
2115	2980
1900	2335

Exit 36							
R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8
170	195	290	110	170	240	130	450
205	235	395	125	170	190	95	465
200	235	465	195	190	260	140	480
270	140	415	180	105	175	170	455

MD 187/WB Ramps				
WBL	WBT	NBL	NBT	SBT
130	0	170	2355	1530
95	0	205	2850	1515
140	0	200	2745	1635
170	0	270	2190	1450

6-7A	1660
7-8A	1610
8-9A	1770
9-10A	1625

6-7A	2525
7-8A	3055
8-9A	2945
9-10A	2460

MD 187 (south)

SB	NB
1730	2350
1630	2785
1840	2675
1695	2230

EB	WB
4935	4870
4735	4555
4215	4465
3595	3795

3120
3250
2950
3025

3185
3215
3275
3435

MD 355 (north)

SB	NB
1980	2110
2040	2460
2150	2820
1995	2715

Exit 34				
R 1	R 2	R 4	R 5	R 6
535	1150	560	820	505
345	1120	475	795	440
335	1205	440	900	405
380	950	330	765	460

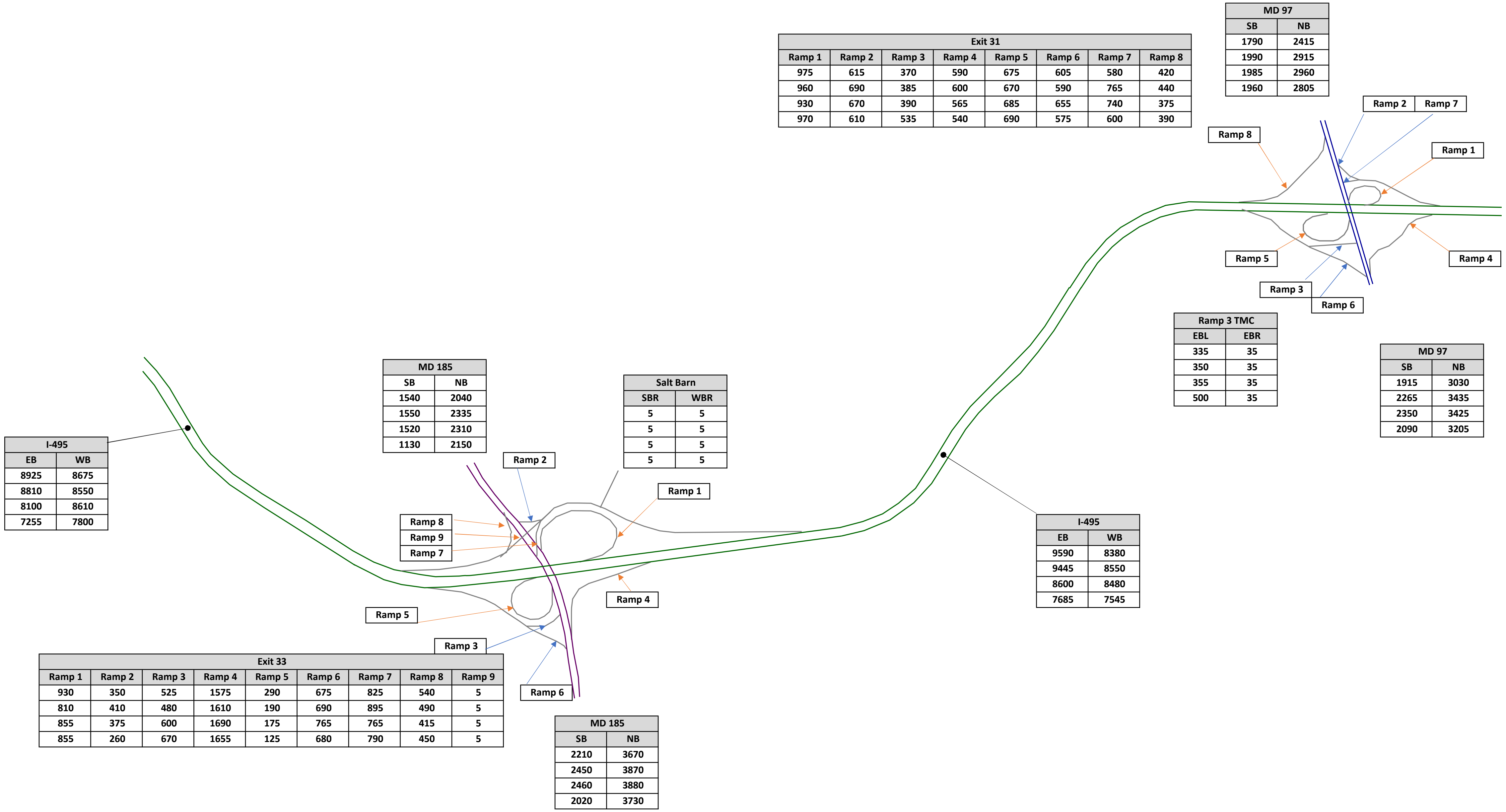
Exit 35	
R 1	R 6
1160	875
1230	920
1220	1160
1140	930

EB	WB
8925	8675
8810	8550
8100	8610
7255	7800

MD 355 (south)

SB	NB
2540	3215
2610	3385
2815	3605
2620	3615

I-495 North Side PM
Future Preferred Alternative Peak Period Volumes



Exit 31							
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
975	615	370	590	675	605	580	420
960	690	385	600	670	590	765	440
930	670	390	565	685	655	740	375
970	610	535	540	690	575	600	390

MD 97	
SB	NB
1790	2415
1990	2915
1985	2960
1960	2805

Ramp 3 TMC	
EBL	EBR
335	35
350	35
355	35
500	35

MD 97	
SB	NB
1915	3030
2265	3435
2350	3425
2090	3205

MD 185	
SB	NB
1540	2040
1550	2335
1520	2310
1130	2150

Salt Barn	
SBR	WBR
5	5
5	5
5	5
5	5

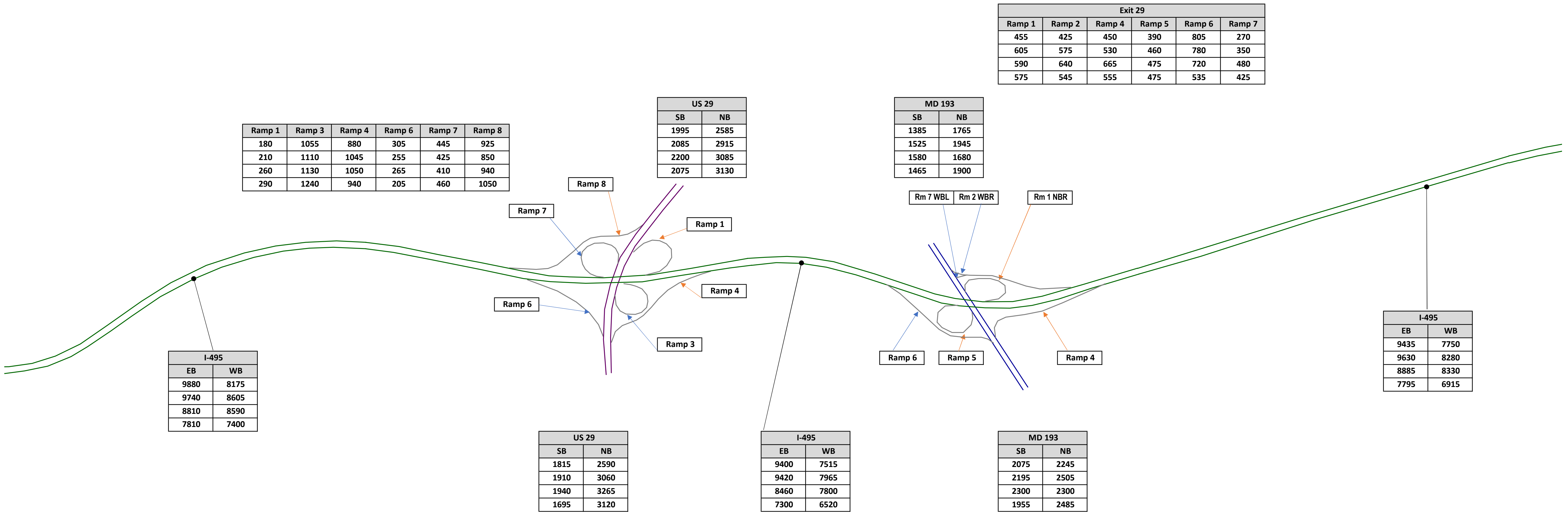
I-495	
EB	WB
8925	8675
8810	8550
8100	8610
7255	7800

I-495	
EB	WB
9590	8380
9445	8550
8600	8480
7685	7545

Exit 33								
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9
930	350	525	1575	290	675	825	540	5
810	410	480	1610	190	690	895	490	5
855	375	600	1690	175	765	765	415	5
855	260	670	1655	125	680	790	450	5

MD 185	
SB	NB
2210	3670
2450	3870
2460	3880
2020	3730

I-495 North Side PM
Future Preferred Alternative Peak Period Volumes



Exit 29					
Ramp 1	Ramp 2	Ramp 4	Ramp 5	Ramp 6	Ramp 7
455	425	450	390	805	270
605	575	530	460	780	350
590	640	665	475	720	480
575	545	555	475	535	425

US 29	
SB	NB
1995	2585
2085	2915
2200	3085
2075	3130

MD 193	
SB	NB
1385	1765
1525	1945
1580	1680
1465	1900

Ramp 1	Ramp 3	Ramp 4	Ramp 6	Ramp 7	Ramp 8
180	1055	880	305	445	925
210	1110	1045	255	425	850
260	1130	1050	265	410	940
290	1240	940	205	460	1050

I-495	
EB	WB
9435	7750
9630	8280
8885	8330
7795	6915

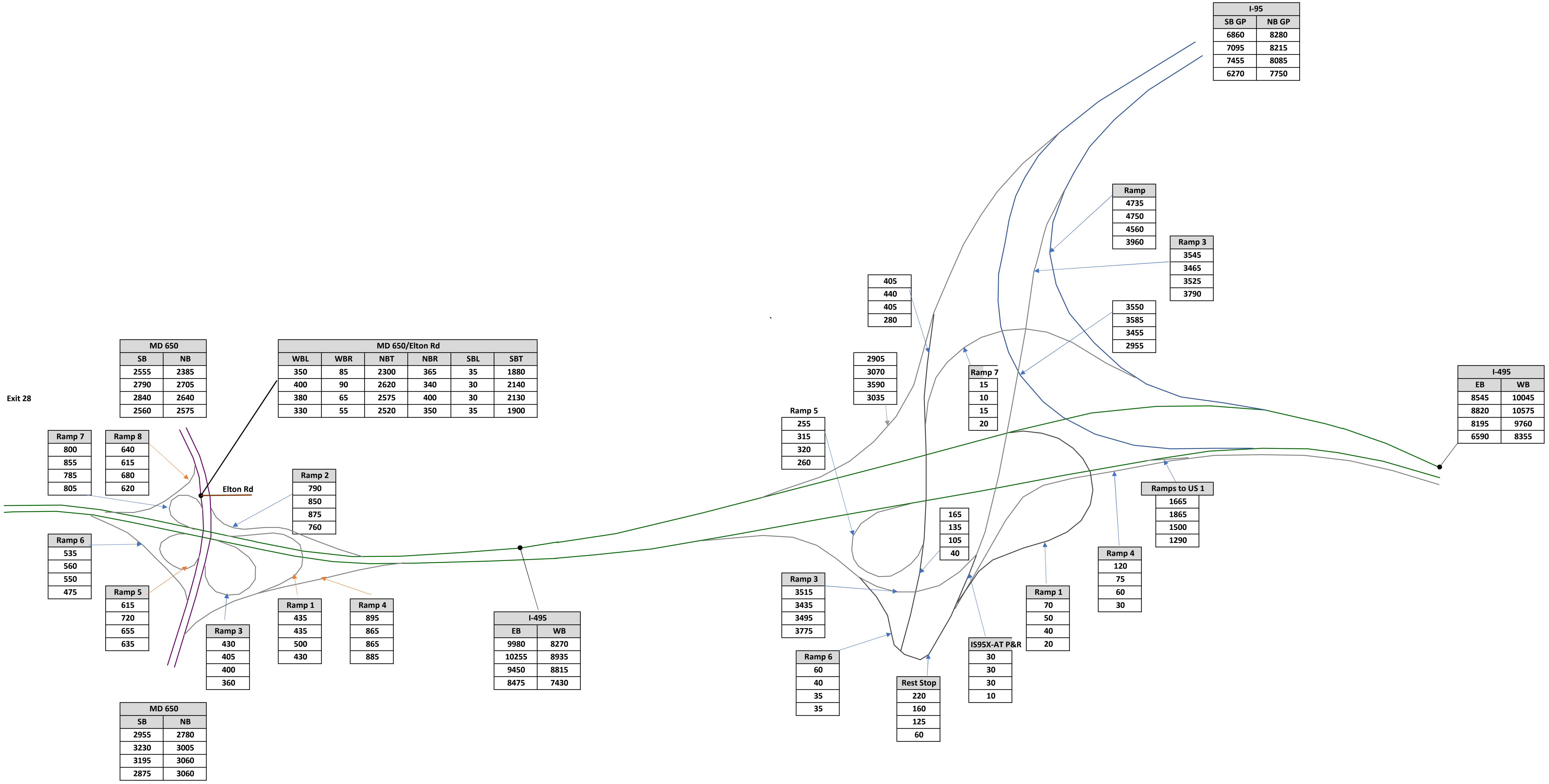
I-495	
EB	WB
9880	8175
9740	8605
8810	8590
7810	7400

US 29	
SB	NB
1815	2590
1910	3060
1940	3265
1695	3120

I-495	
EB	WB
9400	7515
9420	7965
8460	7800
7300	6520

MD 193	
SB	NB
2075	2245
2195	2505
2300	2300
1955	2485

I-495 North Side PM
Future Preferred Alternative Peak Period Volumes



MD 650	
SB	NB
2555	2385
2790	2705
2840	2640
2560	2575

MD 650/Elton Rd					
WBL	WBR	NBT	NBR	SBL	SBT
350	85	2300	365	35	1880
400	90	2620	340	30	2140
380	65	2575	400	30	2130
330	55	2520	350	35	1900

Ramp 7
800
855
785
805

Ramp 8
640
615
680
620

Ramp 2
790
850
875
760

Ramp 6
535
560
550
475

Ramp 5
615
720
655
635

Ramp 3
430
405
400
360

Ramp 1
435
435
500
430

Ramp 4
895
865
865
885

I-495	
EB	WB
9980	8270
10255	8935
9450	8815
8475	7430

MD 650	
SB	NB
2955	2780
3230	3005
3195	3060
2875	3060

I-95	
SB GP	NB GP
6860	8280
7095	8215
7455	8085
6270	7750

Ramp
4735
4750
4560
3960

Ramp 3
3545
3465
3525
3790

405
440
405
280

3550
3585
3455
2955

2905
3070
3590
3035

Ramp 7
15
10
15
20

I-495	
EB	WB
8545	10045
8820	10575
8195	9760
6590	8355

Ramp 5
255
315
320
260

Ramps to US 1
1665
1865
1500
1290

165
135
105
40

Ramp 4
120
75
60
30

Ramp 3
3515
3435
3495
3775

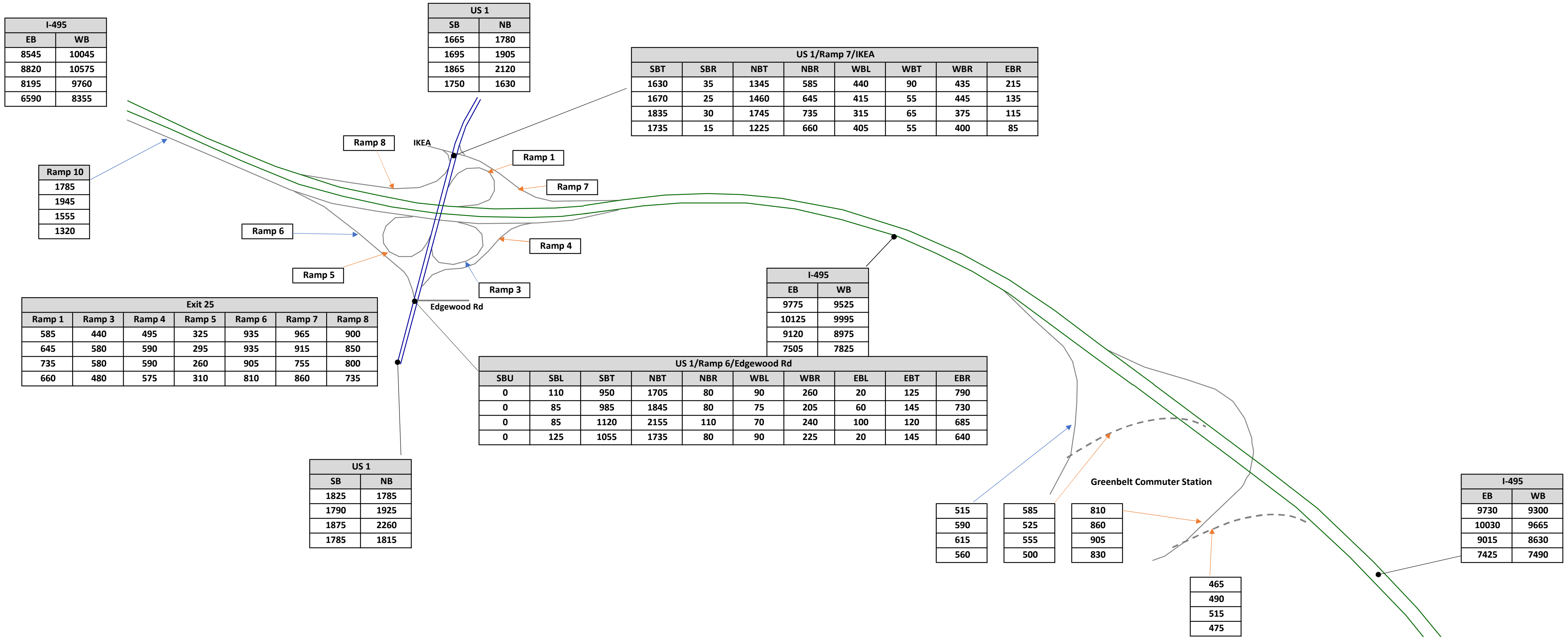
Ramp 1
70
50
40
20

IS95X-AT P&R
30
30
30
10

Ramp 6
60
40
35
35

Rest Stop
220
160
125
60

I-495 North East Side PM
Future Preferred Alternative Peak Period Volumes



I-495	
EB	WB
8545	10045
8820	10575
8195	9760
6590	8355

US 1	
SB	NB
1665	1780
1695	1905
1865	2120
1750	1630

US 1/Ramp 7/IKEA							
SBT	SBR	NBT	NBR	WBL	WBT	WBR	EBR
1630	35	1345	585	440	90	435	215
1670	25	1460	645	415	55	445	135
1835	30	1745	735	315	65	375	115
1735	15	1225	660	405	55	400	85

Ramp 10
1785
1945
1555
1320

Exit 25						
Ramp 1	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
585	440	495	325	935	965	900
645	580	590	295	935	915	850
735	580	590	260	905	755	800
660	480	575	310	810	860	735

I-495	
EB	WB
9775	9525
10125	9995
9120	8975
7505	7825

US 1/Ramp 6/Edgewood Rd									
SBU	SBL	SBT	NBT	NBR	WBL	WBR	EBL	EBT	EBR
0	110	950	1705	80	90	260	20	125	790
0	85	985	1845	80	75	205	60	145	730
0	85	1120	2155	110	70	240	100	120	685
0	125	1055	1735	80	90	225	20	145	640

US 1	
SB	NB
1825	1785
1790	1925
1875	2260
1785	1815

515
590
615
560

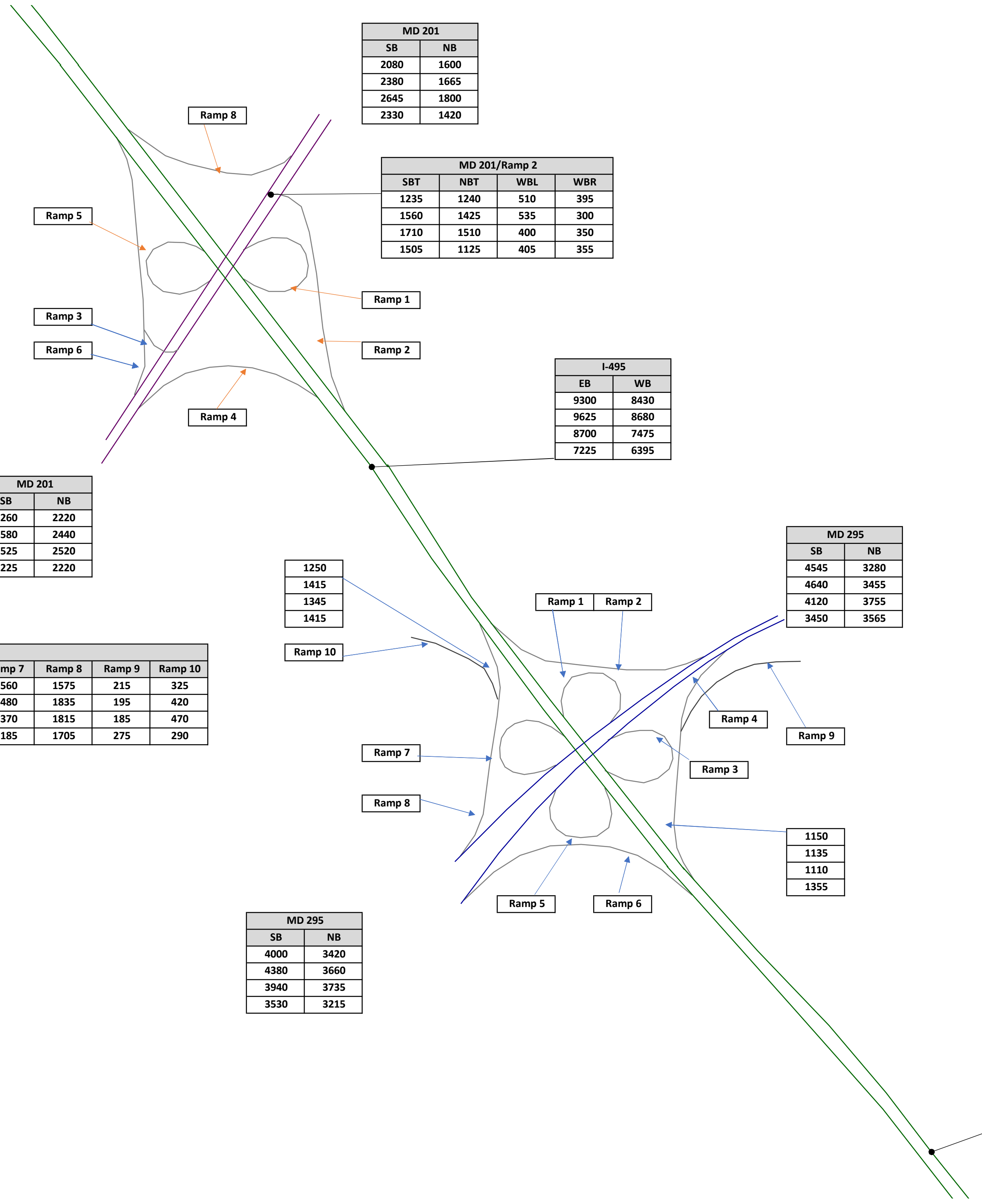
585
525
555
500

810
860
905
830

465
490
515
475

I-495	
EB	WB
9730	9300
10030	9665
9015	8630
7425	7490

I-495 North East Side PM
Future Preferred Alternative Peak Period Volumes



MD 201	
SB	NB
2080	1600
2380	1665
2645	1800
2330	1420

MD 201/Ramp 2			
SBT	NBT	WBL	WBR
1235	1240	510	395
1560	1425	535	300
1710	1510	400	350
1505	1125	405	355

Exit 23						
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8
955	900	610	670	690	1180	815
1025	840	645	695	745	1205	795
1000	755	580	650	750	1135	910
1055	760	490	585	710	1005	805

I-495	
EB	WB
9300	8430
9625	8680
8700	7475
7225	6395

MD 201	
SB	NB
2260	2220
2580	2440
2525	2520
2225	2220

	MD 193	
	EB	WB
3PM	1985	1465
4PM	2610	1875
5PM	2825	1960
6PM	2390	1845

MD 295	
SB	NB
4545	3280
4640	3455
4120	3755
3450	3565

1250
1415
1345
1415

MD 193

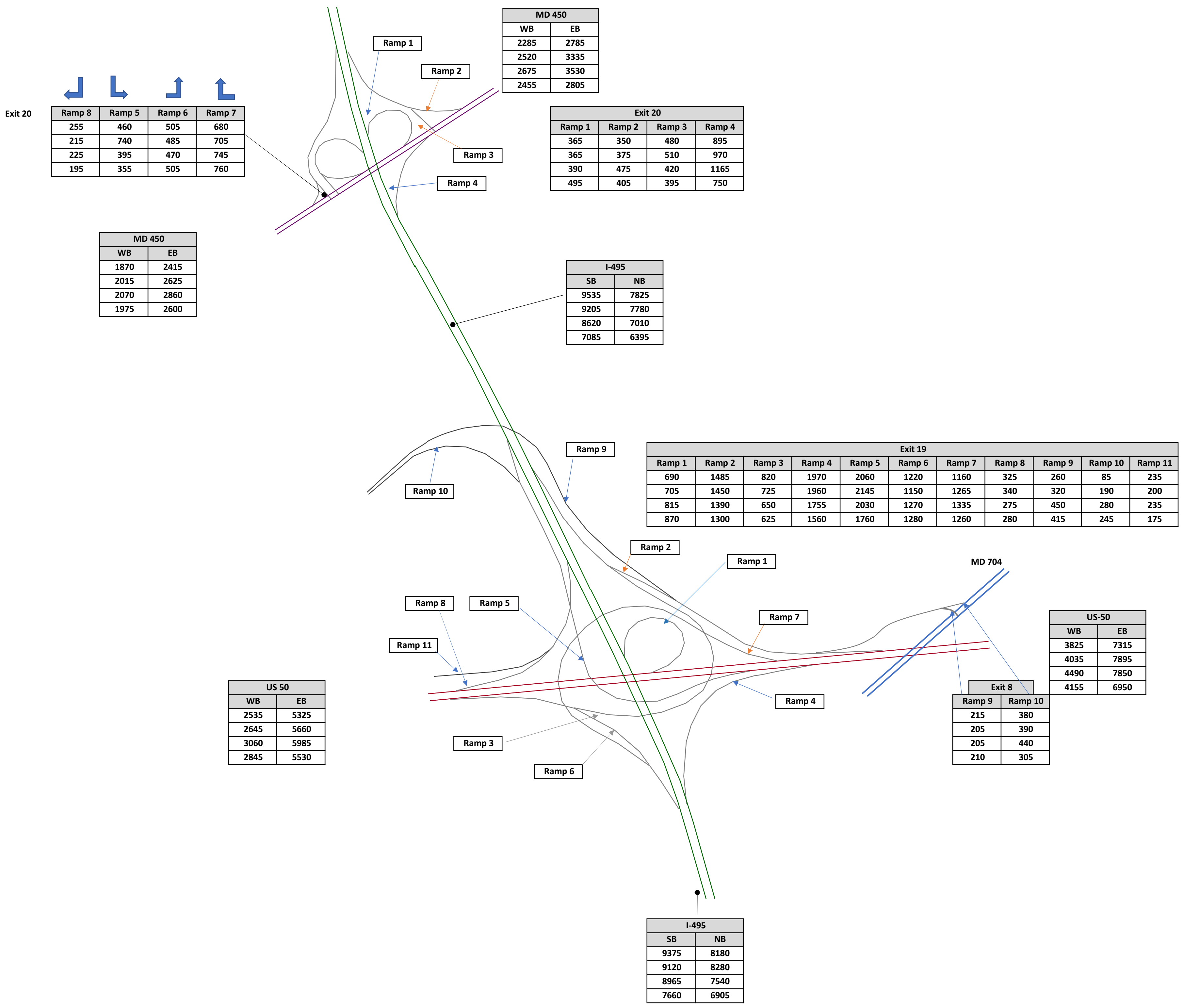
3PM
4PM
5PM
6PM

Exit 22									
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
45	610	1620	935	580	40	1560	1575	215	325
35	655	1860	940	740	25	1480	1835	195	420
30	655	1610	925	720	20	1370	1815	185	470
50	485	1365	1080	660	25	1185	1705	275	290

1150
1135
1110
1355

MD 295	
SB	NB
4000	3420
4380	3660
3940	3735
3530	3215

I-495	
SB	NB
9065	7405
8970	7335
8020	6345
6365	5950



Exit 20

Ramp 8	Ramp 5	Ramp 6	Ramp 7
255	460	505	680
215	740	485	705
225	395	470	745
195	355	505	760

MD 450	
WB	EB
2285	2785
2520	3335
2675	3530
2455	2805

Exit 20			
Ramp 1	Ramp 2	Ramp 3	Ramp 4
365	350	480	895
365	375	510	970
390	475	420	1165
495	405	395	750

MD 450	
WB	EB
1870	2415
2015	2625
2070	2860
1975	2600

I-495	
SB	NB
9535	7825
9205	7780
8620	7010
7085	6395

Exit 19										
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10	Ramp 11
690	1485	820	1970	2060	1220	1160	325	260	85	235
705	1450	725	1960	2145	1150	1265	340	320	190	200
815	1390	650	1755	2030	1270	1335	275	450	280	235
870	1300	625	1560	1760	1280	1260	280	415	245	175

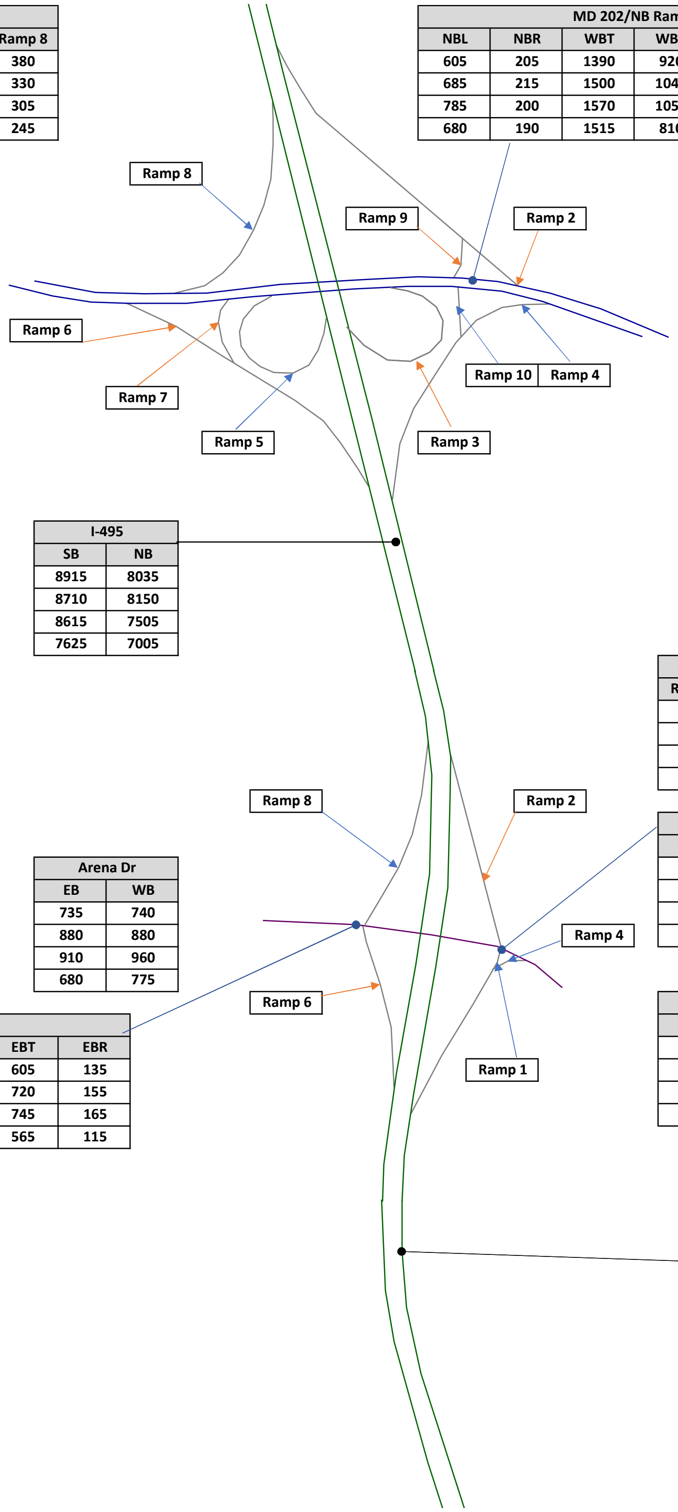
US-50	
WB	EB
3825	7315
4035	7895
4490	7850
4155	6950

Exit 8	
Ramp 9	Ramp 10
215	380
205	390
205	440
210	305

US 50	
WB	EB
2535	5325
2645	5660
3060	5985
2845	5530

I-495	
SB	NB
9375	8180
9120	8280
8965	7540
7660	6905

I-495 East Side PM
Future Preferred Alternative Peak Period Volumes



Exit 17			
Ramp 5	Ramp 6	Ramp 7	Ramp 8
885	525	275	380
880	545	245	330
950	575	335	305
720	565	365	245

MD 202/NB Ramps					
NBL	NBR	WBT	WBR	EBL	EBT
605	205	1390	920	10	2085
685	215	1500	1040	15	2340
785	200	1570	1055	5	2505
680	190	1515	810	15	2250

Ramp 10 TMC	
NBR	NBL
605	205
685	215
785	200
680	190

Exit 17				
Ramp 2	Ramp 3	Ramp 4	Ramp 9	Ramp 10
940	200	205	10	810
1060	165	215	15	900
1075	140	205	5	990
830	120	195	15	875

MD 202	
EB	WB
1940	2100
2185	2265
2275	2330
2230	2075

MD 202	
SB	NB
2495	2335
2765	2560
2910	2650
2635	2345

I-495	
SB	NB
8915	8035
8710	8150
8615	7505
7625	7005

Exit 16				
Ramp 1	Ramp 2	Ramp 4	Ramp 6	Ramp 8
130	480	215	370	490
135	500	220	375	710
125	465	245	390	810
145	430	205	310	590

MD 214/NB Ramps						
NBL	NBT	NBR	WBT	WBR	EBL	EBT
130	0	215	660	220	260	645
135	0	220	700	210	290	875
125	0	245	735	200	265	965
145	0	205	605	160	270	665

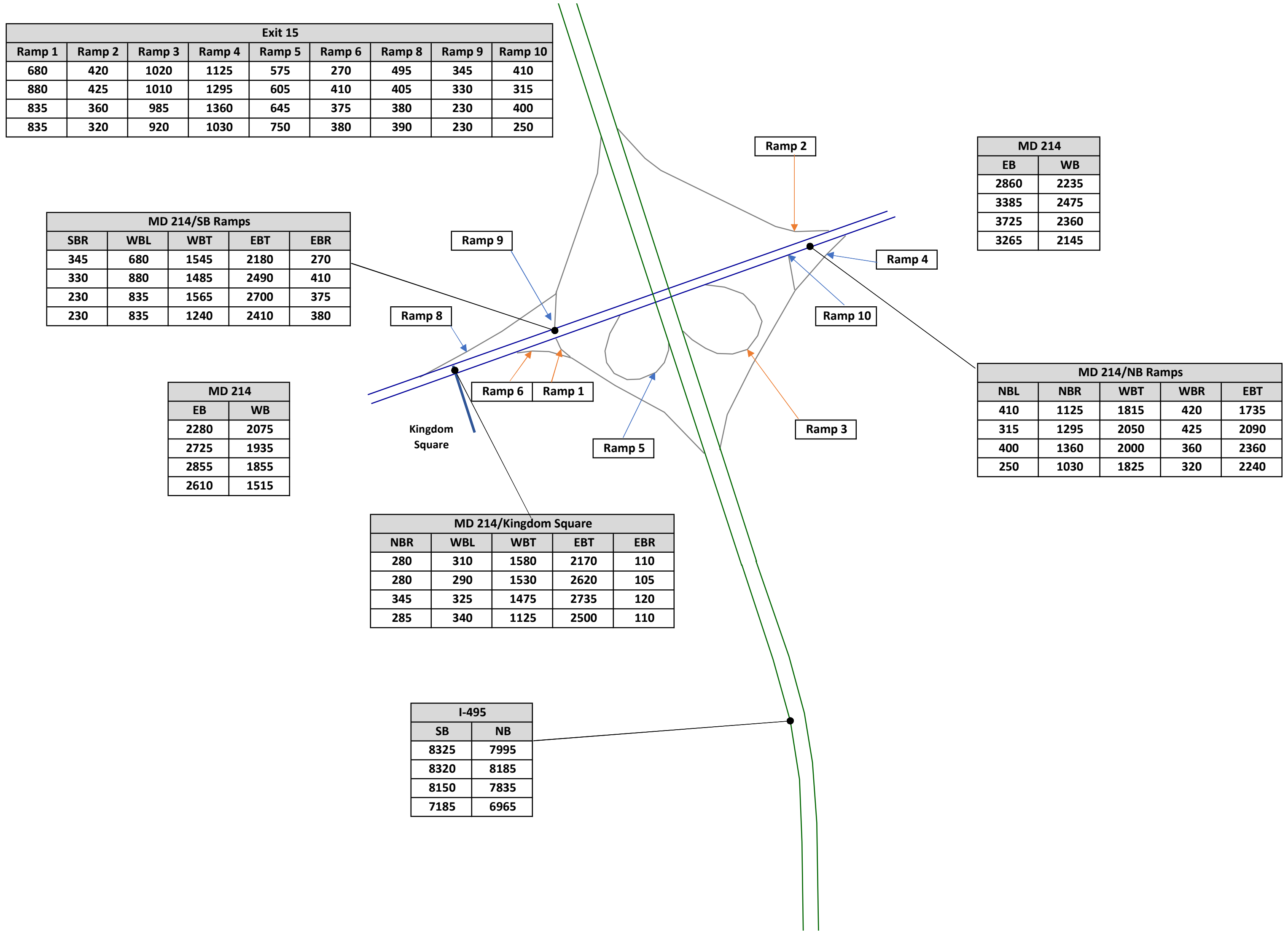
Arena Dr	
EB	WB
735	740
880	880
910	960
680	775

Arena Dr	
EB	WB
860	875
1095	910
1210	935
870	765

MD 214/SB Ramps						
SBL	SBT	SBR	WBL	WBT	EBT	EBR
300	0	190	240	550	605	135
440	0	265	220	615	720	155
480	0	325	225	635	745	165
370	0	220	195	555	565	115

I-495	
SB	NB
8790	7905
8375	8010
8195	7415
7340	6925

I-495 East Side PM
Future Preferred Alternative Peak Period Volumes



Exit 15

Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 8	Ramp 9	Ramp 10
680	420	1020	1125	575	270	495	345	410
880	425	1010	1295	605	410	405	330	315
835	360	985	1360	645	375	380	230	400
835	320	920	1030	750	380	390	230	250

MD 214/SB Ramps

SBR	WBL	WBT	EBT	EBR
345	680	1545	2180	270
330	880	1485	2490	410
230	835	1565	2700	375
230	835	1240	2410	380

MD 214

EB	WB
2860	2235
3385	2475
3725	2360
3265	2145

MD 214/NB Ramps

NBL	NBR	WBT	WBR	EBT
410	1125	1815	420	1735
315	1295	2050	425	2090
400	1360	2000	360	2360
250	1030	1825	320	2240

MD 214

EB	WB
2280	2075
2725	1935
2855	1855
2610	1515

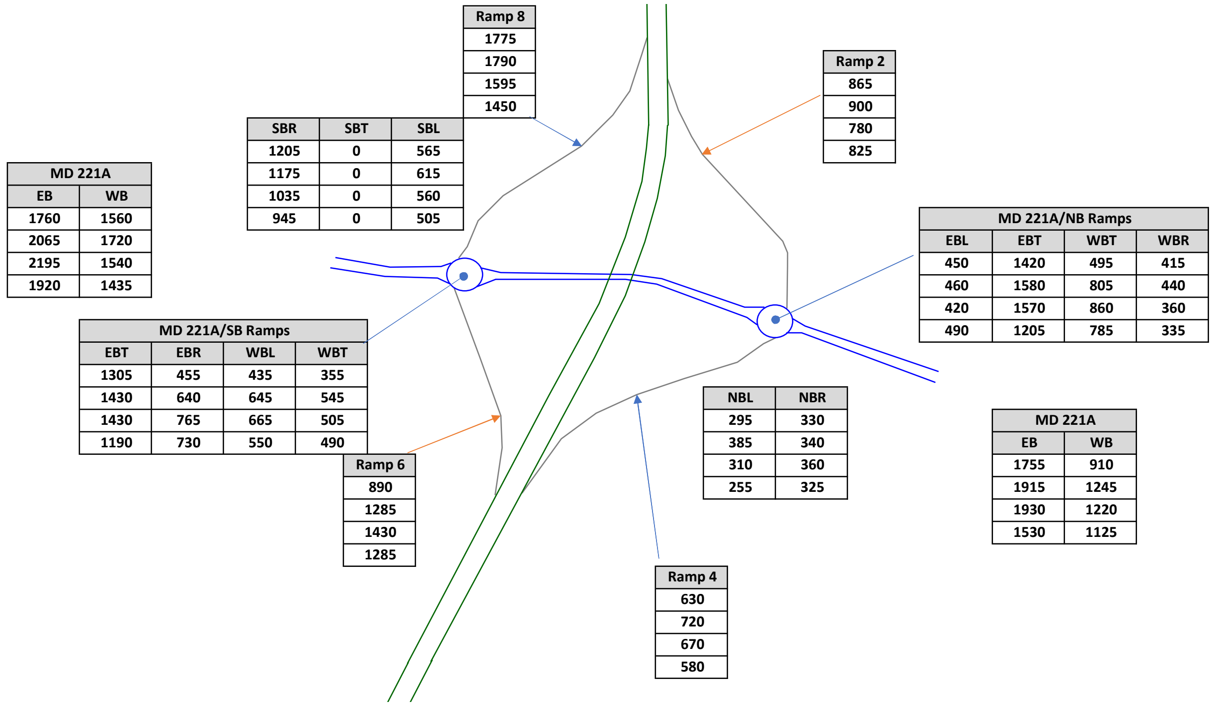
MD 214/Kingdom Square

NBR	WBL	WBT	EBT	EBR
280	310	1580	2170	110
280	290	1530	2620	105
345	325	1475	2735	120
285	340	1125	2500	110

I-495

SB	NB
8325	7995
8320	8185
8150	7835
7185	6965

I-495 East Side PM
Future Preferred Alternative Peak Period Volumes



Ramp 8
1775
1790
1595
1450

SBR	SBT	SBL
1205	0	565
1175	0	615
1035	0	560
945	0	505

MD 221A	
EB	WB
1760	1560
2065	1720
2195	1540
1920	1435

MD 221A/SB Ramps			
EBT	EBR	WBL	WBT
1305	455	435	355
1430	640	645	545
1430	765	665	505
1190	730	550	490

Ramp 6
890
1285
1430
1285

Ramp 2
865
900
780
825

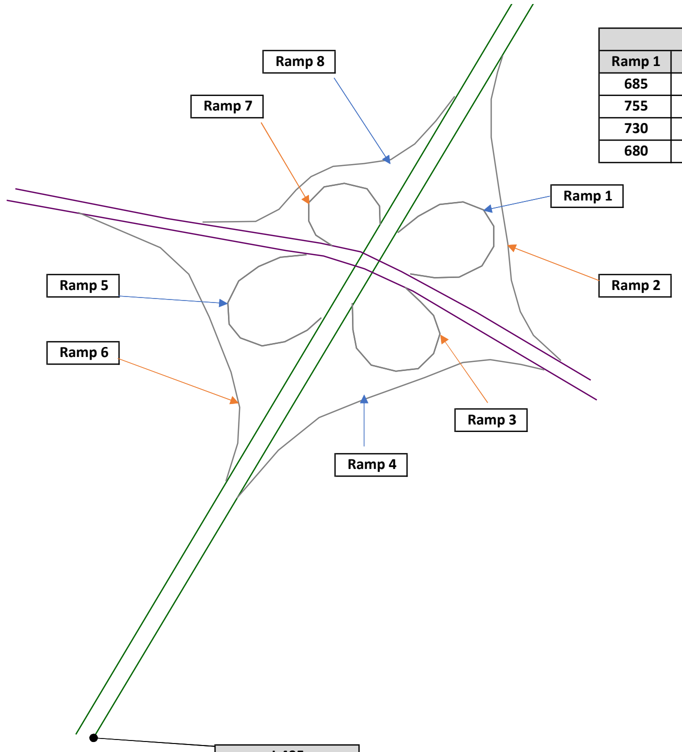
MD 221A/NB Ramps			
EBL	EBT	WBT	WBR
450	1420	495	415
460	1580	805	440
420	1570	860	360
490	1205	785	335

NBL	NBR
295	330
385	340
310	360
255	325

MD 221A	
EB	WB
1755	910
1915	1245
1930	1220
1530	1125

Ramp 4
630
720
670
580

I-495 East Side PM
Future Preferred Alternative Peak Period Volumes



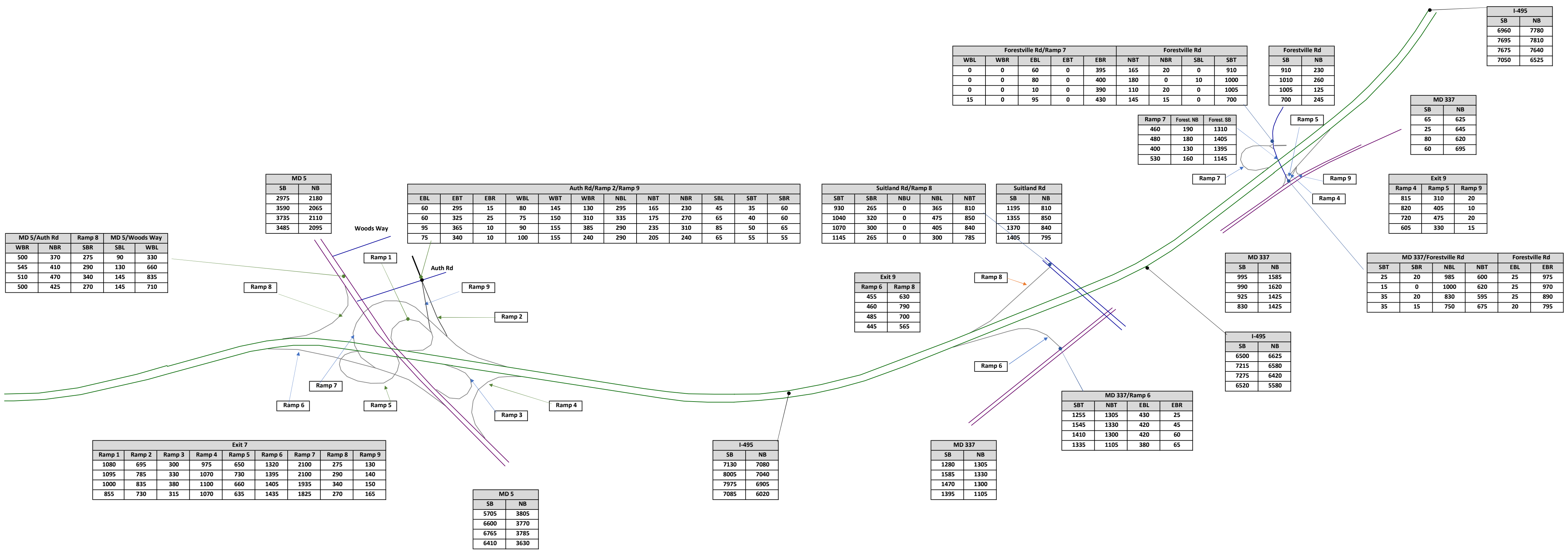
Exit 11							
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
685	1030	770	1135	1050	545	795	780
755	1035	830	915	990	780	875	785
730	895	810	890	895	650	735	800
680	800	870	795	755	820	730	765

MD 4	
SB	NB
2455	1900
2780	2015
2880	1940
2615	1685

MD 4	
SB	NB
3315	2265
3075	2385
3210	2040
2475	1765

I-495	
SB	NB
6960	7780
7695	7810
7675	7640
7050	6525

I-495 South Side PM
Future Preferred Alternative Peak Period Volumes



MD 5/Auth Rd		Ramp 8	MD 5/Woods Way	
WBR	NBR	SBR	SBL	WBL
500	370	275	90	330
545	410	290	130	660
510	470	340	145	835
500	425	270	145	710

MD 5	
SB	NB
2975	2180
3590	2065
3735	2110
3485	2095

Auth Rd/Ramp 2/Ramp 9											
EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
60	295	15	80	145	130	295	165	230	45	35	60
60	325	25	75	150	310	335	175	270	65	40	60
95	365	10	90	155	385	290	235	310	85	50	65
75	340	10	100	155	240	290	205	240	65	55	55

Suitland Rd/Ramp 8				
SBT	SBR	NBU	NBL	NBT
930	265	0	365	810
1040	320	0	475	850
1070	300	0	405	840
1145	265	0	300	785

Suitland Rd	
SB	NB
1195	810
1355	850
1370	840
1405	795

Exit 9	
Ramp 6	Ramp 8
455	630
460	790
485	700
445	565

Forestville Rd/Ramp 7					Forestville Rd			
WBL	WBR	EBL	EBT	EBR	NBT	NBR	SBL	SBT
0	0	60	0	395	165	20	0	910
0	0	80	0	400	180	0	10	1000
0	0	10	0	390	110	20	0	1005
15	0	95	0	430	145	15	0	700

Forestville Rd	
SB	NB
910	230
1010	260
1005	125
700	245

Ramp 7	Forest. NB	Forest. SB
460	190	1310
480	180	1405
400	130	1395
530	160	1145

I-495	
SB	NB
6960	7780
7695	7810
7675	7640
7050	6525

MD 337	
SB	NB
65	625
25	645
80	620
60	695

Exit 9		
Ramp 4	Ramp 5	Ramp 9
815	310	20
820	405	10
720	475	20
605	330	15

MD 337	
SB	NB
995	1585
990	1620
925	1425
830	1425

MD 337/Forestville Rd				Forestville Rd	
SBT	SBR	NBL	NBT	EBL	EBR
25	20	985	600	25	975
15	0	1000	620	25	970
35	20	830	595	25	890
35	15	750	675	20	795

I-495	
SB	NB
6500	6625
7215	6580
7275	6420
6520	5580

MD 337/Ramp 6			
SBT	NBT	EBL	EBR
1255	1305	430	25
1545	1330	420	45
1410	1300	420	60
1335	1105	380	65

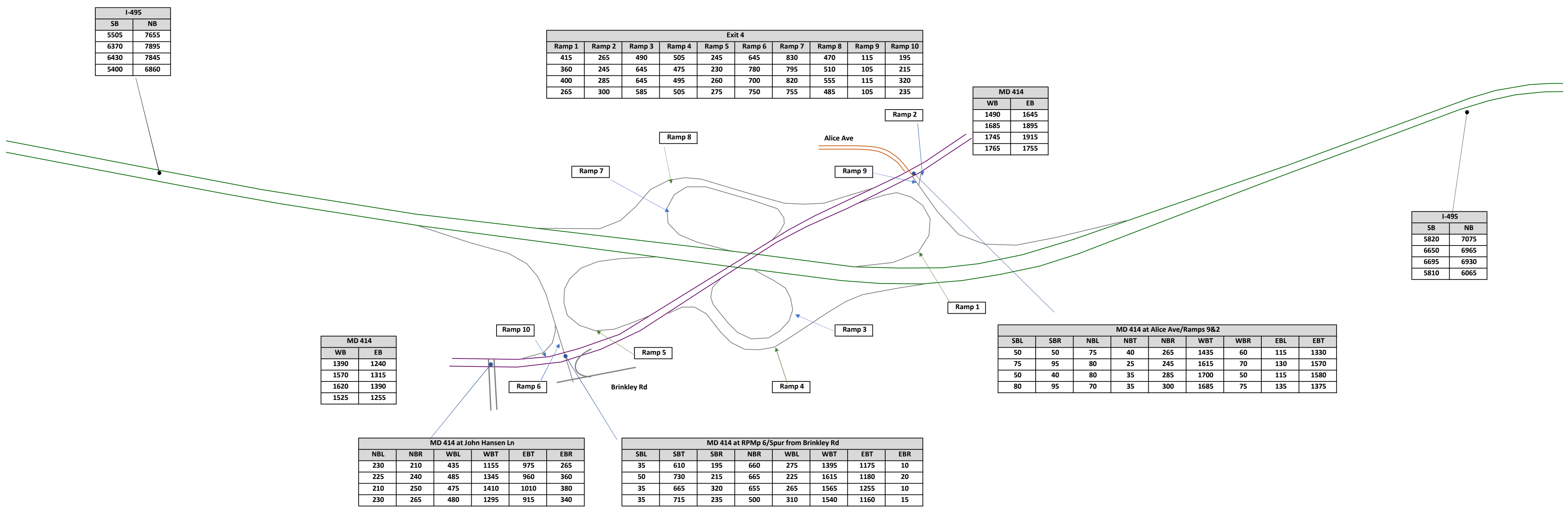
Exit 7								
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9
1080	695	300	975	650	1320	2100	275	130
1095	785	330	1070	730	1395	2100	290	140
1000	835	380	1100	660	1405	1935	340	150
855	730	315	1070	635	1435	1825	270	165

I-495	
SB	NB
7130	7080
8005	7040
7975	6905
7085	6020

MD 337	
SB	NB
1280	1305
1585	1330
1470	1300
1395	1105

MD 5	
SB	NB
5705	3805
6600	3770
6765	3785
6410	3630

I-495 South Side PM
Future Preferred Alternative Peak Period Volumes



I-495	
SB	NB
5505	7655
6370	7895
6430	7845
5400	6860

Exit 4									
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8	Ramp 9	Ramp 10
415	265	490	505	245	645	830	470	115	195
360	245	645	475	230	780	795	510	105	215
400	285	645	495	260	700	820	555	115	320
265	300	585	505	275	750	755	485	105	235

MD 414	
WB	EB
1490	1645
1685	1895
1745	1915
1765	1755

I-495	
SB	NB
5820	7075
6650	6965
6695	6930
5810	6065

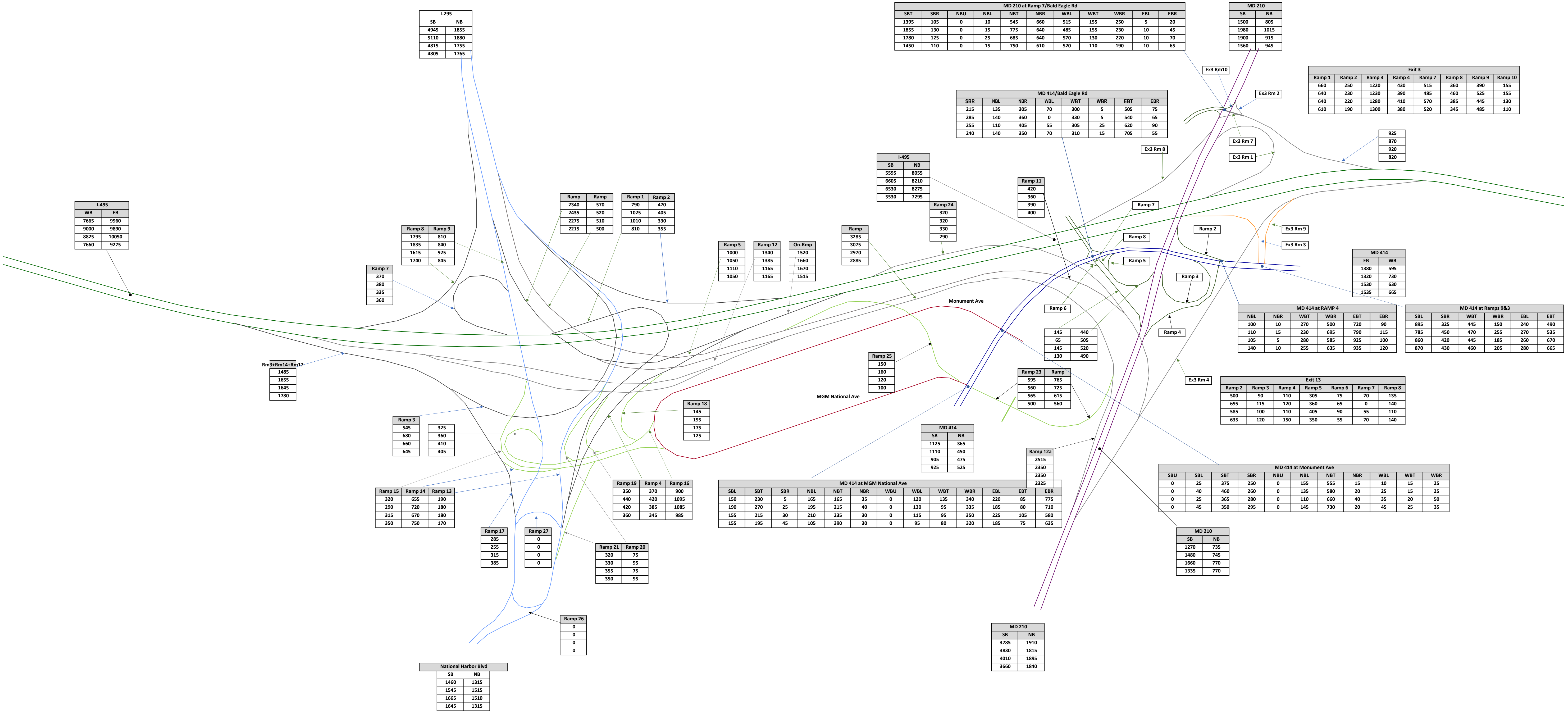
MD 414 at Alice Ave/Ramps 9&2								
SBL	SBR	NBL	NBT	NBR	WBT	WBR	EBL	EBT
50	50	75	40	265	1435	60	115	1330
75	95	80	25	245	1615	70	130	1570
50	40	80	35	285	1700	50	115	1580
80	95	70	35	300	1685	75	135	1375

MD 414	
WB	EB
1390	1240
1570	1315
1620	1390
1525	1255

MD 414 at John Hansen Ln					
NBL	NBR	WBL	WBT	EBT	EBR
230	210	435	1155	975	265
225	240	485	1345	960	360
210	250	475	1410	1010	380
230	265	480	1295	915	340

MD 414 at RPMp 6/Spur from Brinkley Rd							
SBL	SBT	SBR	NBR	WBL	WBT	EBT	EBR
35	610	195	660	275	1395	1175	10
50	730	215	665	225	1615	1180	20
35	665	320	655	265	1565	1255	10
35	715	235	500	310	1540	1160	15

I-495 South Side PM
Future Preferred Alternative Peak Period Volumes



I-295	
SB	NB
4945	1855
5110	1880
4815	1755
4805	1765

I-495	
WB	EB
7665	9960
9000	9890
8825	10050
7660	9275

Ramp 8	Ramp 9
1795	810
1835	840
1615	925
1740	845

Ramp 7
370
380
335
360

Ramp	Ramp
2340	570
2435	520
2275	510
2215	500

Ramp 1	Ramp 2
790	470
1025	405
1010	330
810	355

Ramp 5
1000
1050
1110
1050

Ramp 12
1340
1385
1165
1165

On-Rmp
1520
1660
1670
1515

Ramp
3285
3075
2970
2885

I-495	
SB	NB
5595	8055
6605	8210
6530	8275
5530	7295

Ramp 24
320
320
330
290

MD 210 at Ramp 7/Bald Eagle Rd										
SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR	EBL	EBR
1395	105	0	10	545	660	515	155	250	5	20
1855	130	0	15	775	640	485	155	230	10	45
1780	125	0	25	685	640	570	130	220	10	70
1450	110	0	15	750	610	520	110	190	10	65

MD 210	
SB	NB
1500	805
1980	1015
1900	915
1560	945

MD 414/Bald Eagle Rd							
SBR	NBL	NBR	WBL	WBT	WBR	EBT	EBR
215	135	305	70	300	5	505	75
285	140	360	0	330	5	540	65
255	110	405	55	305	25	620	90
240	140	350	70	310	15	705	55

Exit 3							
Ramp 1	Ramp 2	Ramp 3	Ramp 4	Ramp 7	Ramp 8	Ramp 9	Ramp 10
660	250	1220	430	515	360	390	155
640	230	1230	390	485	460	525	155
640	220	1280	410	570	385	445	130
610	190	1300	380	520	345	485	110

925
870
920
820

Ramp 11
420
360
390
400

MD 414	
EB	WB
1380	595
1320	730
1530	630
1535	665

MD 414 at RAMP 4					
NBL	NBR	WBT	WBR	EBT	EBR
100	10	270	500	720	90
110	15	230	695	790	115
105	5	280	585	925	100
140	10	255	635	935	120

MD 414 at Ramps 9&3					
SBL	SBR	WBT	WBR	EBL	EBT
895	325	445	150	240	490
785	450	470	255	270	535
860	420	445	185	260	670
870	430	460	205	280	665

145	440
65	505
145	520
130	490

Ramp 23	Ramp
595	765
560	725
565	615
500	560

Exit 13						
Ramp 2	Ramp 3	Ramp 4	Ramp 5	Ramp 6	Ramp 7	Ramp 8
500	90	110	305	75	70	135
695	115	120	360	65	0	140
585	100	110	405	90	55	110
635	120	150	350	55	70	140

Rm3+Rm14+Rm17
1485
1655
1645
1780

Ramp 3
545
680
660
645

325
360
410
405

Ramp 18
145
195
175
125

Ramp 25
150
160
120
100

Ramp 15	Ramp 14	Ramp 13
320	655	190
290	720	180
315	670	180
350	750	170

Ramp 19	Ramp 4	Ramp 16
350	370	900
440	420	1095
420	385	1085
360	345	985

MD 414	
SB	NB
1125	365
1110	450
905	475
925	525

Ramp 12a
2515
2350
2350
2325

MD 414 at MGM National Ave												
SBL	SBT	SBR	NBL	NBT	NBR	WBU	WBL	WBT	WBR	EBL	EBT	EBR
150	230	5	165	165	35	0	120	135	340	220	85	775
190	270	25	195	215	40	0	130	95	335	185	80	710
155	215	30	210	235	30	0	115	95	350	225	105	580
155	195	45	105	390	30	0	95	80	320	185	75	635

MD 414 at Monument Ave										
SBU	SBL	SBT	SBR	NBU	NBL	NBT	NBR	WBL	WBT	WBR
0	25	375	250	0	155	555	15	10	15	25
0	40	460	260	0	135	580	20	25	15	25
0	25	365	280	0	110	660	40	35	20	50
0	45	350	295	0	145	730	20	45	25	35

Ramp 17
285
255
315
385

Ramp 27
0
0
0
0

Ramp 21	Ramp 20
320	75
330	95
355	75
350	95

MD 210	
SB	NB
1270	735
1480	745
1660	770
1335	770

Ramp 26
0
0
0
0

MD 210	
SB	NB
3785	1910
3830	1815
4010	1895
3660	1840

National Harbor Blvd	
SB	NB
1460	1315
1545	1515
1665	1510
1645	1315

APPENDIX B:

MWCOG User Guide

National Capital Region
Transportation Planning Board

Metropolitan Washington Council of Governments (COG)
National Capital Region Transportation Planning Board (TPB)

User's Guide for the COG/TPB Travel Demand Forecasting Model, Version 2.3.75

Volume 1 of 2: Main Report and Appendix A (Flowcharts)

December 5, 2018

777 NORTH CAPITOL STREET NE, SUITE 300, WASHINGTON, DC 20002
MWCOG.ORG/TPB (202) 962-3200

User's Guide for the COG/TPB Travel Demand Forecasting Model, Version 2.3.75: Volume 1 of 2

December 5, 2018

About the TPB

The National Capital Region Transportation Planning Board (TPB) is the federally designated metropolitan planning organization (MPO) for metropolitan Washington. It is responsible for developing and carrying out a continuing, cooperative, and comprehensive transportation planning process in the metropolitan area. Members of the TPB include representatives of the transportation agencies of the states of Maryland and Virginia and the District of Columbia, 23 local governments, the Washington Metropolitan Area Transit Authority, the Maryland and Virginia General Assemblies, and nonvoting members from the Metropolitan Washington Airports Authority and federal agencies. The TPB is staffed by the Department of Transportation Planning at the Metropolitan Washington Council of Governments (COG).

About COG

The Metropolitan Washington Council of Governments (COG) is an independent, nonprofit association that brings area leaders together to address major regional issues in the District of Columbia, suburban Maryland, and Northern Virginia. COG's membership is comprised of 300 elected officials from 23 local governments, the Maryland and Virginia state legislatures, and U.S. Congress.

Credits

Director, Department of Transportation Planning (DTP): Kanti Srikanth
Director, Travel Forecasting and Emissions Analysis Program, DTP: Ronald Milone (retired Oct. 2018)
Report Authors:

- This Update: Ray Ngo, Mark Moran, Meseret Seifu, and Feng Xie
- Past Versions: Ron Milone, Mark Moran, Meseret Seifu, Hamid Humeida, and Mary Martchouk

Oversight: COG/TPB Travel Forecasting Subcommittee

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Colophon

This report was created using Microsoft Word 2016 and Visio 2016, and was converted to a PDF file using Adobe Acrobat DC. This report consists of two sections: the main report and the appendices. The files for these two sections can be found in a folder on COG's internal file server (I:\ateam\docum\fy19\tpb_tdfm_gen2\ver2.3\travel_model_user_guide).

1 Introduction

The National Capital Region Transportation Planning Board (NCRTPB or simply TPB) is the federally designated Metropolitan Planning Organization (MPO) for the Washington, D.C. metropolitan area and is also one of several policy boards that operate at the Metropolitan Washington Council of Governments (MWCOG or simply COG). The TPB is staffed by COG's Department of Transportation Planning (DTP). The COG/TPB staff develops and maintains, with consultant assistance, a series of regional travel demand forecasting models that are used for the regional transportation planning process in the Washington, D.C. area. These regional travel demand models are developed under the guidance of the Travel Forecasting Subcommittee (TFS), a subcommittee of TPB's Technical Committee. At any given time, the COG/TPB staff maintains at least two regional travel demand models: an adopted, production-use model and a developmental model. The production-use model is the one that is used in planning studies conducted by COG/TPB and is made available to outside parties.[1] The developmental model is the one that is currently under development by COG/TPB staff, and is generally not made available to outside parties, since it is not yet considered a finished product.

This report explains how to setup and run the TPB Travel Demand Forecasting Model, **Version 2.3.75, which is the latest in a series of adopted, regional, production-use travel demand models, within the "Version 2.3" model family**, developed by the COG/TPB staff for regional transportation planning work in the Washington, D.C. metropolitan area. The previous adopted, regional, production-use travel demand model was the Ver. 2.3.70 model. All the model versions in the Version 2.3 model family are aggregate, trip-based, four-step travel demand models.

Between 2008 and 2011, the TPB Version 2.3 travel model was **calibrated to year-2007 conditions** and this work was documented in a calibration report dated January 20, 2012.[2] In 2013, the Version 2.3 Travel Model was **validated to year-2010 conditions**,[3] with an emphasis on validating the model's highway assignment results. Updates to the model resulting from this validation work were part of Build 52 of the Version 2.3 Travel Model (a.k.a., Ver. 2.3.52). Although the model was validated to year-2010 conditions, it was not recalibrated, so the January 20, 2012 calibration report remains the latest documentation for calibration work. The previous model version, Ver. 2.3.70, is documented in a two-volume user's guide.[4] This current user's guide is derived from the previous user's guide.

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[1] The procedures for requesting the model can be found on the "Data Requests" webpage (https://www.mwcog.org/transportation/data-and-tools/modeling/data-requests/).

[2] Ronald Milone et al., "Calibration Report for the TPB Travel Forecasting Model, Version 2.3, on the 3,722-Zone Area System," Final Report (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, January 20, 2012), https://www.mwcog.org/transportation/data-and-tools/modeling/model-documentation/.

[3] Ronald Milone to Files, "2010 Validation of the Version 2.3 Travel Demand Model," Memorandum, June 30, 2013.

[4] Mark Moran, Ron Milone, and Meseret Seifu, "User's Guide for the COG/TPB Travel Demand Forecasting Model, Version 2.3.70. Volume 1 of 2: Main Report and Appendix A (Flowcharts)" (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, November 28, 2017), https://www.mwcog.org/transportation/data-and-tools/modeling/model-documentation/; Mark

1.1 Adoption of the regional travel demand forecasting model by the TPB

The TPB does not *explicitly* adopt a specific version of the regional travel demand model. Instead, the adoption is made *implicitly* when the TPB adopts both 1) a given version of its Long-Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP); and 2) the findings from an air quality conformity (AQC) analysis of the financially constrained element of the LRTP and the associated TIP. The latest version of the LRTP is known as Visualize 2045, which was finalized in 2018 and has an out year of 2045. Visualize 2045 has both a financially constrained element and an aspirational element. The constrained element is what used to be called the Constrained Long-Range Plan (CLRP). The purpose of the AQC analysis is to determine whether the air pollution created by motor vehicles ("mobile emissions") traveling on the transportation network represented in the constrained element of the LRTP (in this case, Visualize 2045) is consistent with (conforms to) the state air quality implementation plans (SIPs). The *implicit adoption* of a specific model version occurs by virtue of the fact that that model version was the one used for the analysis presented to the TPB. Consequently, the Ver. 2.3.75 TPB Travel Demand Forecasting Model (TDFM) became the adopted, production-use model on Oct. 17, 2018, when the TPB adopted the following three resolutions:

- R4-2019: Resolution finding that the Constrained Element of the Long-Range Transportation Plan (Visualize 2045) and the FY 2019-2024 TIP conform with the requirements of the Clean Air Act Amendments of 1990
- R5-2019: Resolution approving the Visualize 2045 Long-Range Transportation Plan for the National Capital Region
- R6-2019: Resolution approving the FY 2019-2024 TIP

1.2 History of the Version 2.3 Travel Model

The Version 2.3 travel model is a series or family of model versions. The first iteration of the Version 2.3 model became the adopted regional travel model for the Washington, D.C. metropolitan area on November 16, 2011. In 2012, a newer version of the model, known as Build 39 of the Version 2.3 Travel Model, or Ver. 2.3.39, was used for the air quality conformity analysis of the 2012 Constrained Long-Range Plan and the FY 2013-2018 Transportation Improvement Plan. In 2013, Build 52 of the model was used for the air quality conformity analysis of the 2013 CLRP and FY 2013-2018 TIP. In 2015, Build 57a of the Version 2.3 model (Ver. 2.3.57a) became the production-use model. In 2016, the Ver. 2.3.66 model became the production-use model. In 2017, the Ver. 2.3.70 model became the adopted model. Most recently, in 2018, the Ver 2.3.75 model became the adopted, production-use regional travel demand model. Below is a list of milestones in the development of the TPB regional travel demand model from 2008 to the present:

Moran, Ron Milone, and Meseret Seifu, "User's Guide for the COG/TPB Travel Demand Forecasting Model, Version 2.3.70: Volume 2 of 2: Appendices B (Batch Files), C (Cube Voyager Scripts), and D (AEMS Fortran Control Files)" (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, November 28, 2017).

- March 1, 2008: TPB Version 2.2 Travel Model was released.[5]
    - The Version 2.2 travel model was developed on the 2,191-TAZ area system and most of its component models were estimated and calibrated with data from the COG/TPB 1994 Household Travel Survey (HTS), which included about 4,800 households.
- June 30, 2008: Draft TPB Version 2.3 Travel Model was released.[6]
    - At the time when the Version 2.2 Travel Model was released, a parallel effort was also underway to combine a nested-logit mode choice (NL MC) model and revised truck models into the Version 2.2 framework. This development effort proved to be viable and resulted in a release of what was then called the "draft Version 2.3 travel model" in June of 2008. The draft Version 2.3 model, like Version 2.2, was developed on the 2,191-TAZ area system.
    - The draft Version 2.3 model was not brought into production given that two related events were in motion during 2008. First, a new round of travel data collection was underway, including a major regional household travel survey (the COG/TPB 2007/2008 Household Travel Survey, which included about 11,000 households) and two transit on-board surveys (a bus on-board survey and a Metrorail passenger survey). Second, a new TAZ system was in development. The new zone system was envisioned to be developed over the same geographic area as the 2,191-TAZ system (6,800 square miles), but with smaller average zone sizes. TPB staff ultimately decided that the draft Version 2.3 Travel Model should not become the approved regional travel model until it incorporated the new zone system and the new data from the 2007/2008 Household Travel Survey (HTS) and the on-board transit surveys.
- February 28, 2011: TPB Version 2.3 Travel Model, Build 9, was released.[7]
    - From 2008 to 2012, TPB staff conducted the following activities:
        - Compiling and cleaning new survey data.
        - Preparing calibration files based on the new 3,722 TAZ system
        - Estimating and calibrating various sub-models in the regional travel model.
- November 11, 2011: TPB Version 2.3 Travel Model, Build 36, was released.[8] This is the model that became the adopted regional travel model for the for the Washington, D.C. metropolitan area on November 16, 2011.

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[5] Ronald Milone et al., *TPB Travel Forecasting Model, Version 2.2: Specification, Validation, and User's Guide* (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, March 1, 2008), http://www.mwcog.org/transportation/activities/models/documentation.asp.

[6] Ronald Milone et al., "TPB Travel Forecasting Model, Version 2.3: Specification, Validation, and User's Guide," Draft Report (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, June 30, 2008).

[7] Ronald Milone et al., "TPB Version 2.3 Travel Forecasting Model for the 3,722-Zone Area System: Calibration Report," Draft report (Washington, D.C.: National Capital Region Transportation Planning Board, February 28, 2011).

[8] Ronald Milone et al., "Calibration Report for the TPB Travel Forecasting Model, Version 2.3.36, on the 3,722-Zone Area System," Draft report (Washington, D.C.: National Capital Region Transportation Planning Board, November 18, 2011), http://www.mwcog.org/uploads/committee-documents/aF1fV1xW20111118131827.pdf.

- December 21, 2011: TPB Version 2.3 Travel Model, Build 38, was released. This model was documented in January 2012.[9]
- July 17, 2013: TPB Version 2.3 Travel Model, Build 52 became the production-use travel model.
- October 15, 2014: The TPB Version 2.3.57 model became the production-use travel model.
- October 21, 2015: The TPB Version 2.3.57a model became the production-use travel model.
- November 16, 2016: The TPB Version 2.3.66 model became the production-use travel model.
- October 18, 2017: The TPB Version 2.3.70 model became the production-use travel model.
- October 17, 2018: The TPB Version 2.3.75 model became the production-use travel model.

1.3 Recent changes to the model: From Ver. 2.3.70 to Ver. 2.3.75

There have been only four updates to the regional travel demand model since the previously adopted model (Ver. 2.3.70). The updates are listed Table 1 and are described in more detail later in this report. The four model updates cover three types of updates:

- Bug fixes (1 update)
- New/enhanced features (3 updates)

Bug fixes are the most important type of update and have the highest priority. Software bugs can be found by either internal or external users of the travel demand model code. New/enhanced features bring improvement to the model or make it easier to use. Documentation relates to comments or annotations within scripts or batch files that explain what is occurring in the software code. As explained later, the bug fix did not cause a change in the modeled results, and only two among three updates caused a change in the modeled results.

Three of four updates can also be found in a recent internal memo.[10] It should be noted that the memo was written before the TPB's decision to modify the model so that it no longer implemented the Metrorail constraint to and through the regional core.

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[9] Ronald Milone et al., "User's Guide for the TPB Travel Forecasting Model, Version 2.3, Build 38, on the 3,722-Zone Area System," Final Report (Washington, D.C.: National Capital Region Transportation Planning Board, January 20, 2012), http://www.mwcog.org/transportation/activities/models/documentation.asp.

[10] Ray Ngo to Mark Moran, Ronald Milone, and Dusan Vuksan, "Updates to the TPB Travel Demand Forecasting Model, Generation 2, Version 2.3.70 for Visualize 2045," Memorandum, March 30, 2018.

Table 1 Updates made to the TPB travel demand model Version 2.3.75 (compared to Ver. 2.3.70)

#	Description	Type of update	Further details and benefit(s)	Effect on model results?
1	Streamlined the way that HOT-lane facilities are modeled by removing the High-Occupancy Vehicle (HOV) Highway Skim Replacement (HSR) procedure from the model	New/improved feature	Due to the low benefits and drawbacks associated with the HSR procedure, the process was eliminated. The elimination helps reduce model run times. For example, in model application (after toll setting has already been accomplished), the model no longer needs two runs per alternative/year (i.e., "base" and "final"). Now, only one run per alternative/year is needed (i.e., "final").	Yes
2	Added a check to report the active transit stations with "zero" drive-access skim values	New/improved feature	This feature reports the inaccessible stations whose drive-access skims are all zeros, typically due to a network coding issue.	No
3	Updated *unbuild_net.s* with the latest version of the travel model and its associated networks	Bug fix	This tool to unbuild a highway network was updated to work with the latest model network inputs.	No
4	Removed the Metrorail constraint to and through the regional core, as per a policy change by the Washington Metropolitan Area Transit Authority (WMATA), resulting from new dedicated funding for transit	New/improved feature	TPB approved the removal of Metrorail constraint from the model on May 16, 2018. Therefore, the model runs for the scenarios after 2020 will no longer require the transit constraint information from the 2020 model run. More details about the history and rationale behind the Metrorail constraint can be found in this report.	Yes

1.3.1 Update 1: Removed the HOV Highway Skim Replacement (HSR) procedure

1.3.1.1 Update type

New/improved feature

1.3.1.2 Effects on the model results?

This update had a small impact on the model output at the regional level. A sensitivity test was conducted for year-2040 conditions using the Ver. 2.3.70 Travel Model with network inputs from the Off-Cycle Update of the 2016 CLRP and land use inputs from the Cooperative Forecasts, Round 9.0. After the update, at the regional level, the total number of vehicles assigned increased by 1,505 (less than one-tenth a percent relative to the baseline), total Vehicle Miles of Traveled (VMT) decreased by only 105,796 or 0.1%, and total transit increased by 3,679 or 0.3%. Those changes at regional level were considered negligible. At the jurisdictional level and link level, the changes were more noticeable, discussed below, as documented in an internal memo, entitled "Evaluating the Modeling Effects of Eliminating the 'HOV Skim Replacement' Process": [11]

> *At the jurisdictional level, moderate shifts away from HOV3+ travel are observed in the Northern Virginia jurisdictions with HOT-lane operations in 2040, but this impact is very confined. At the link level, changes to HOV3+ traffic volume are marginal across the regional roadway network. Noticeable increases in AM speeds are observed on some of the I-66 and I-95 HOT-lane segments in peak direction, mainly due to higher tolls and lower volumes resulting from the toll setting process, but these changes are in the favorable direction in terms of accommodating VDOT's policy to maintain HOV3+ traffic conditions on HOT lanes. (p. 10)*

More details on the effects of the update to the model results can be found in the cited memo.

1.3.1.3 Description

With the implementation of High-Occupancy Toll (HOT) facilities in Northern Virginia, the Virginia Department of Transportation (VDOT) required that the toll paying traffic in the HOT lanes should not cause the operating characteristics of the facilities to become degraded, as per federal guidance.[12] To accommodate the VDOT/federal guidance, starting from the Ver. 2.1D#50 model (through the Ver 2.3.70 model), COG/TPB staff developed a modeling procedure often called **HOV3+ Skim Replacement (HSR).** The procedure required two model runs, a "base run" and a "final run", for one modeled scenario, application mode (which is used by most external users), given the estimated toll as a model input. The "**base run**" captured the unimpeded flow of HOV traffic on HOT lanes. The "**final run**" of the travel model allowed all HOT facilities to function as true HOT lanes by using the HOV skims from the

---

[11] Feng Xie and Dusan Vuksan to Files, "Evaluating the Modeling Effects of Eliminating the 'HOV Skim Replacement' Process," Memorandum, March 7, 2018.

[12] "Federal-Aid Highway Program Guidance on High Occupancy Vehicle (HOV) Lanes," U.S. Department of Transportation, Federal Highway Administration, November 2012, http://ops.fhwa.dot.gov/freewaymgmt/hovguidance/chapter3.htm.

"base run" and all other (non-HOV) skims from the "final run". Section 2.4.1 provides a further detailed description of the process from the Version 2.2 Travel Model documentation.[13]

In the Ver. 2.3.75 model, COG staff decided to eliminate the HSR procedure based on the following motivations: [14]

> *While TPB's travel demand model has transformed itself with two major upgrades (i.e., Version 2.2 and Version 2.3) in the past decade, the HSR procedure developed based on the now outdated Version 2.1D#50 model remains unchanged. In recent years, both internal and external model users have suggested that this ad hoc process may have become less pertinent, as TPB's newer generations of travel demand models may have already addressed VDOT's policy requirements related to HOT lanes in an inherent way with new modeling capabilities that were not available when HSR was initially developed.*
>
> *Another major challenge to the HSR process comes from the Maryland side of this region. The Maryland Department of Transportation has announced the Traffic Relief Plan (TRP) in September 2017, which, in the current draft form, entails the addition of two express / toll lanes per direction to I-495, MD-295 and I-270. Different from the HOT lanes in Virginia, the proposed toll lanes in Maryland will not need to comply with the federal requirements regarding HOV facilities, as they will likely operate as Express Toll Lanes (ETLs), which do not exempt HOV vehicles from paying tolls. As TPB is looking to incorporate parts of Maryland's TRP into its upcoming long-range plan "Visualize 2045", the modeling staff has made an assessment that it would be extremely challenging to model two different types of dynamically priced toll lanes with the current HSR process that is only applicable to the Virginia HOT lanes.*
>
> *Furthermore, as TPB's travel demand model will soon undergo a major upgrade to Version 2.5, TPB staff is facing the challenge of tackling significantly increased model run times due to increased model complexity. It thus becomes especially appealing to revisit the multi-run HSR process, which is both complex and long, and to look for ways to improve it or eliminate it. (pp. 2-3)*
>
> *…*
>
> *The application of HSR requires a multi-run process, which is both complex and time-consuming (a complete three-run process can take over a week).*

---

[13] Ronald Milone et al., "TPB Travel Forecasting Model, Version 2.2: Specification, Validation, and User's Guide" (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, March 1, 2008), 1–10 to 1–12.

[14] Feng Xie and Dusan Vuksan to Files, "Evaluating the Modeling Effects of Eliminating the 'HOV Skim Replacement' Process."

> *Importing skims from different base runs could introduce a bias ("noise") to "alternatives analysis", which involves comparing final run results between different alternatives for scenario planning and project planning activities.*
>
> *Since the HSR procedure was designed with a "HOT-Lane-Only" world in mind, the application of this procedure would become extremely challenging when other types of dynamically priced toll lanes (such as ETLs) are modeled along with HOT lanes. (pp. 4-5)*

The HSR procedure elimination resulted in the following changes to the model's components:

Table 2 Affected model's components due to Update 1

File name	Changes
run_Model_[year]_base.bat run_ModelSteps_[year]_base.bat	Removed
run_ModelSteps_[year].bat	Revised
HSR_Highway_Skims_2017HOV2.bat HSR_Highway_Skims.bat	Removed
Joinskims.s	Revised

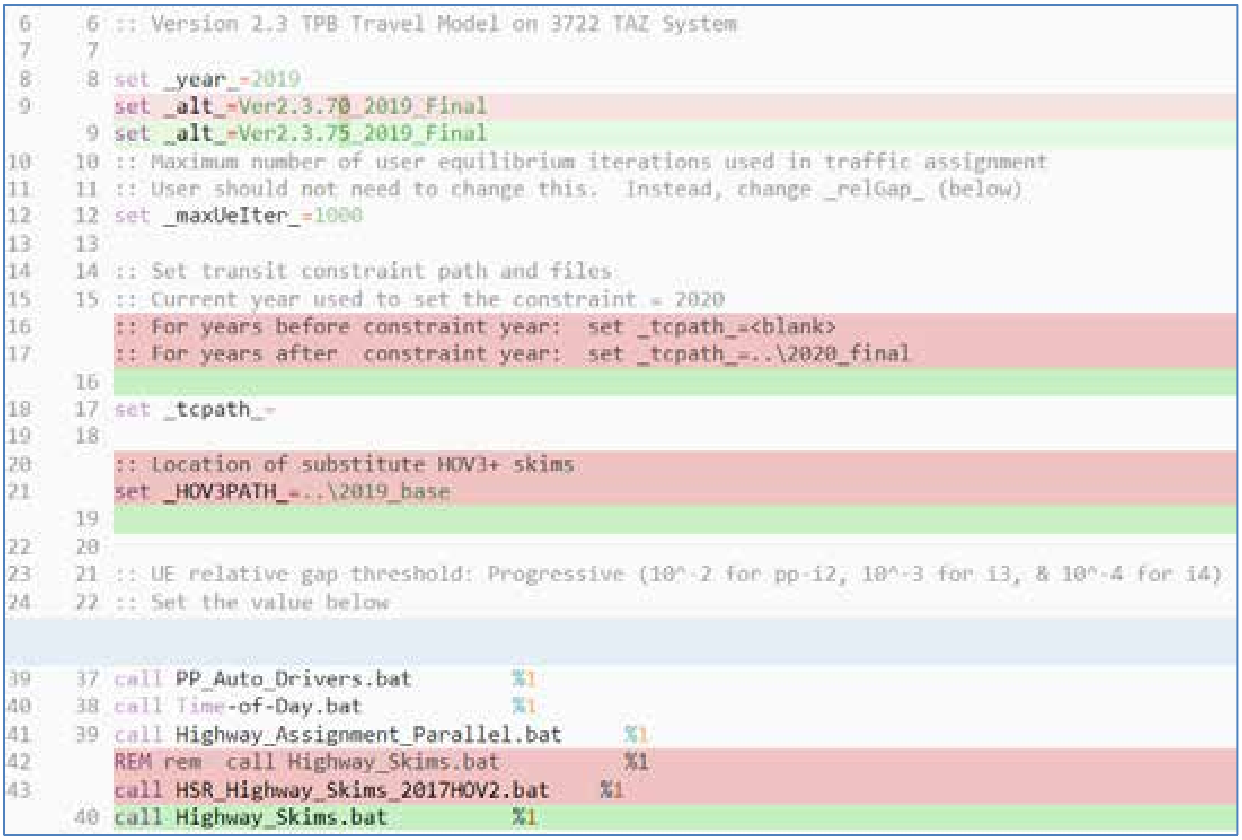
where [year] is the modeling year/scenario, for example 2019 or 2045.

Changes made to run_ModelSteps_[year].bat

Figure 1 to Figure 2 below show the changes made to the *run_ModelSteps_2019.bat*, an example of *run_ModelSteps_[year].bat*. The red and green lines indicate the lines before and after changes. The far-left column shows the line numbers of the scripts before the change and the next column shows the line numbers of the scripts after the change. If a green line is blank, the line is deleted from the batch file. For example, the original lines 20 and 21:

```
:: Location of substitute HOV3+ skims
set _HOV3PATH_=..\2019_base
```

are removed and become blank in line 19 in the updated batch file.



```
:: Version 2.3 TPB Travel Model on 3722 TAZ System

set _year_=2019
set _alt_=Ver2.3.70_2019_Final
set _alt_=Ver2.3.75_2019_Final
:: Maximum number of user equilibrium iterations used in traffic assignment
:: User should not need to change this.  Instead, change _relGap_ (below)
set _maxUeIter_=1000

:: Set transit constraint path and files
:: Current year used to set the constraint = 2020
:: For years before constraint year:  set _tcpath_=<blank>
:: For years after  constraint year:  set _tcpath_=..\2020_final

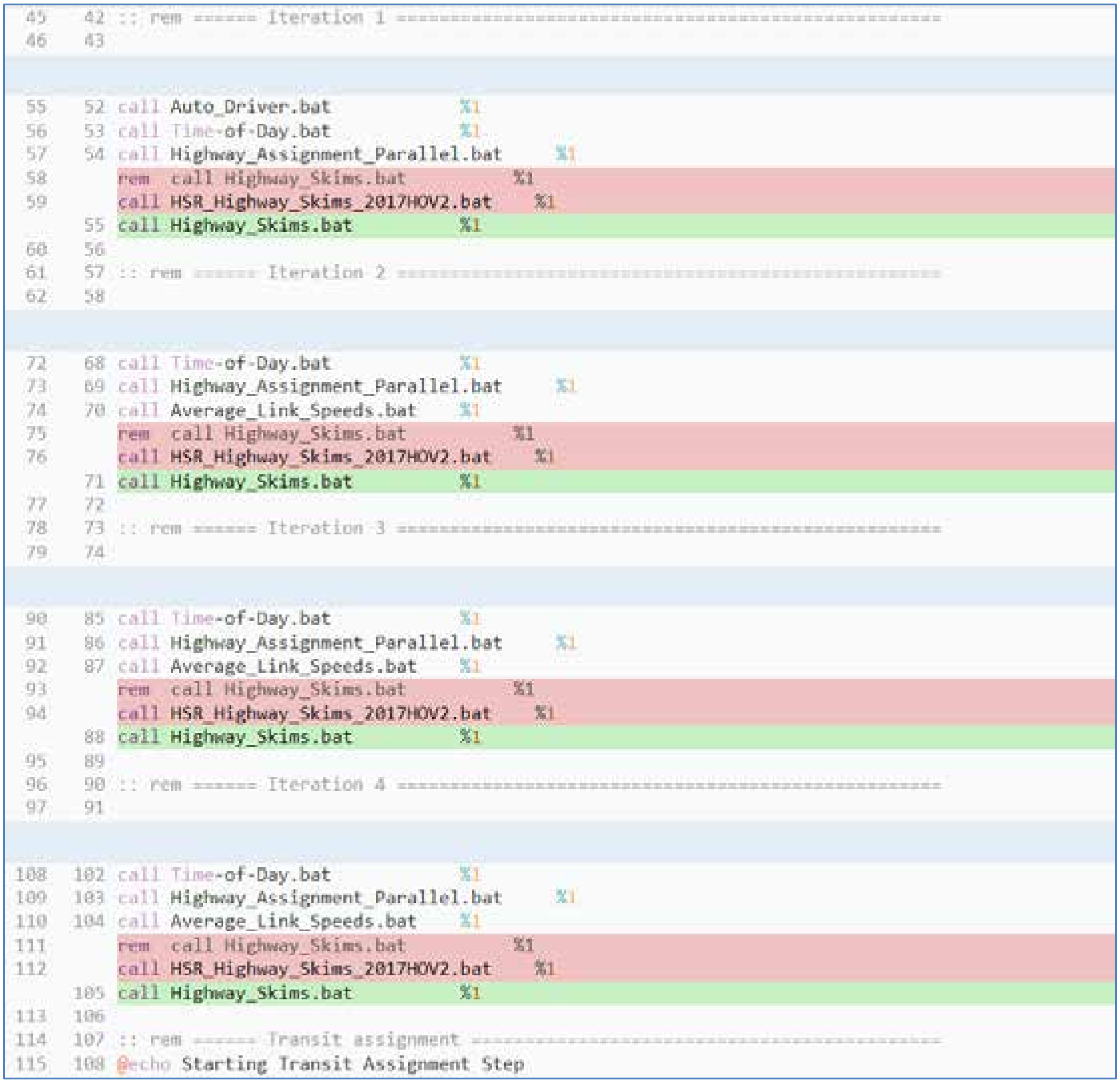
set _tcpath_=

:: Location of substitute HOV3+ skims
set _HOV3PATH_=..\2019_base


:: UE relative gap threshold: Progressive (10^-2 for pp-i2, 10^-3 for i3, & 10^-4 for i4)
:: Set the value below

call PP_Auto_Drivers.bat        %1
call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
REM rem  call Highway_Skims.bat          %1
call HSR_Highway_Skims_2017HOV2.bat    %1
call Highway_Skims.bat          %1
```

Figure 1 Changes made to *run_ModelSteps_[year].bat* after the elimination of the HSR procedure



```
:: rem ====== Iteration 1 ====================================================


call Auto_Driver.bat            %1
call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
rem  call Highway_Skims.bat            %1
call HSR_Highway_Skims_2017HOV2.bat    %1
call Highway_Skims.bat          %1

:: rem ====== Iteration 2 ====================================================


call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
call Average_Link_Speeds.bat    %1
rem  call Highway_Skims.bat            %1
call HSR_Highway_Skims_2017HOV2.bat    %1
call Highway_Skims.bat          %1

:: rem ====== Iteration 3 ====================================================


call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
call Average_Link_Speeds.bat    %1
rem  call Highway_Skims.bat            %1
call HSR_Highway_Skims_2017HOV2.bat    %1
call Highway_Skims.bat          %1

:: rem ====== Iteration 4 ====================================================


call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
call Average_Link_Speeds.bat    %1
rem  call Highway_Skims.bat            %1
call HSR_Highway_Skims_2017HOV2.bat    %1
call Highway_Skims.bat          %1

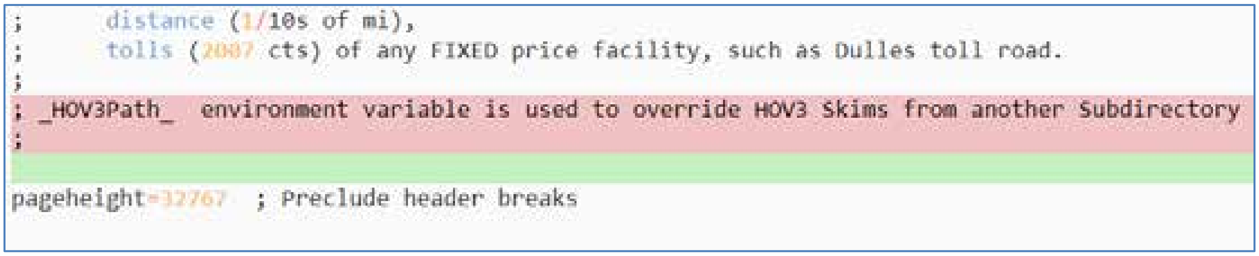
:: rem ====== Transit assignment ============================================
@echo Starting Transit Assignment Step
```

Figure 2 Changes made to *run_ModelSteps_[year].bat* after the elimination of the HSR procedure

As shown above, the HSR procedure elimination replaced the *HSR_Highway_Skim.bat* (or *HSR_Highway_Skim_2017HOV2.bat*) with the Highway_Skim.bat process.

Changes made to *joinskims.s*

The comment regarding the environment variable *_HOV3Path_* in the script *joinskims.s* is removed, as shown in Figure 3, to reflect the HSR procedure elimination. Obviously, a change in code comments has no effect on the model output.



```
;      distance (1/10s of mi),
;      tolls (2007 cts) of any FIXED price facility, such as Dulles toll road.
;
; _HOV3Path_  environment variable is used to override HOV3 Skims from another Subdirectory
;

pageheight=32767  ; Preclude header breaks
```

Figure 3 Changes made to *Joinskims.s* after the elimination of the HSR procedure

1.3.2 Update 2: Reported active transit stations with zero skim values

1.3.2.1 Update type

New/improved feature

1.3.2.2 Effect on model results?

No

1.3.2.3 Description

This update was to address an issue reported by a consultant that travel matrices ("skims") associated with the West Falls Church Station's centroid (5054) were all zeroes. He suspected that it was because the link connecting this node to the network (34939-34938) was marked with a limit code of "9" (which does not get processed in the *Autoacc5.s* step). The limit codes of "9" resulted in default values (dist = 50, speed = 25) when processing this station's drive-access connectors – without qualifying the actual distances and speeds from TAZs.[15]

COG staff proposed a simple check in the travel model to stop the model run and report the issue if the model encounters an active station in the station file which has "zero" skim values.

The proposed update resulted in two changes of the model's components:

Table 3 Affected model's components due to Update 2

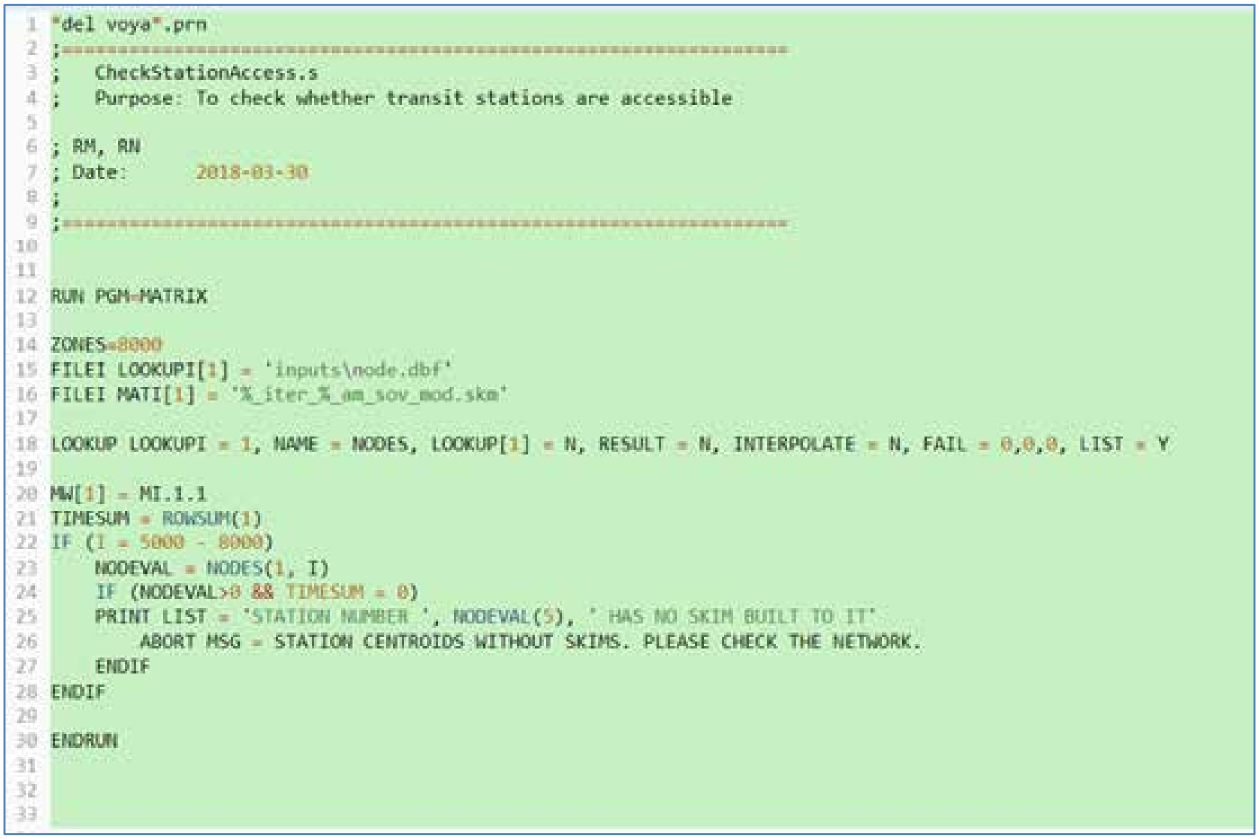
File name	Changes
CheckStationAccess.s	Added
PP_Highway_Skims.bat	Revised

---

[15] Mark S. Moran to Ronald Milone, "Possible Updates to the TPB Travel Demand Forecasting Model, Generation 2, Version 2.3.70," Memorandum, February 8, 2018.

Added *CheckStationAccess.s*

The new script, *CheckStationAccess.s*, shown in Figure 4, is added to the model.



```
*del voya*.prn
;==========================================================================
;   CheckStationAccess.s
;   Purpose: To check whether transit stations are accessible

; RM, RN
; Date:      2018-03-30
;
;==========================================================================


RUN PGM=MATRIX

ZONES=8000
FILEI LOOKUPI[1] = 'inputs\node.dbf'
FILEI MATI[1] = '%_iter_%_am_sov_mod.skm'

LOOKUP LOOKUPI = 1, NAME = NODES, LOOKUP[1] = N, RESULT = N, INTERPOLATE = N, FAIL = 0,0,0, LIST = Y

MW[1] = MI.1.1
TIMESUM = ROWSUM(1)
IF (I = 5000 - 8000)
    NODEVAL = NODES(1, I)
    IF (NODEVAL>0 && TIMESUM = 0)
    PRINT LIST = 'STATION NUMBER ', NODEVAL(5), ' HAS NO SKIM BUILT TO IT'
        ABORT MSG = STATION CENTROIDS WITHOUT SKIMS. PLEASE CHECK THE NETWORK.
    ENDIF
ENDIF

ENDRUN
```

Figure 4 *CheckStationAccess.s*, new script to report the active transit stations with zero skim values

The script searches the node.dbf file for cases where there are no drive-access skim values for nodes 5000 to 8000, which corresponds to the Metrorail PNR centroids (5000-5999), commuter rail PNR centroids (6000-6999), and light rail/BRT PNR centroids (7000-7999). If the program files a station that is disconnected from the highway network, it creates a listing file with the station number and a note that the station “has no skim built to it.” The model results were not affected by the new script.

Changes made to *PP_Highway_Skims.bat*

Figure 5 shows the changes made to *PP_Highway_Skims.bat*. The green lines are newly added to the batch file. There are no changes to the model’s outputs.

```
:: 2018-03-30 RN Add lines to execute a check on whether transit stations are accessible

CD %1
set _iterOrder_=initial


if errorlevel 1 goto error
if exist voya*.prn  copy voya*.prn %_iter_%_%_iterOrder_%_Highway_Skims_Mod_am.rpt /y

:: Check whether transit stations are accessible
if exist voya*.*  del voya*.*
if exist %_iter_%_%_iterOrder_%_CheckStationAccess.rpt  del %_iter_%_%_iterOrder_%_CheckStationAccess.rpt
start /w Voyager.exe  ..\scripts\CheckStationAccess.s /start -Pvoya -S..\%1
if errorlevel 2 (echo STATION CENTROIDS WITHOUT SKIMS. PLEASE CHECK THE NETWORK && goto stationerr)
if errorlevel 3 (echo STATION CENTROIDS WITHOUT SKIMS. PLEASE CHECK THE NETWORK && goto stationerr)
if exist voya*.prn  copy voya*.prn CheckStationAccess.rpt /y


if exist voya*.*  del voya*.*
if exist %_iter_%_%_iterOrder_%_Highway_Skims_mod_md.rpt  del %_iter_%_%_iterOrder_%_Highway_Skims_mod_md.rpt
start /w Voyager.exe  ..\scripts\Highway_Skims_mod_md.s /start -Pvoya -S..\%1



goto end

:stationerr
PAUSE&EXIT

:error
REM  Processing Error....
PAUSE
```

Figure 5 Changes made to *PP_Highway_Skims.bat* to report the active transit stations with zero skim values

1.3.3 Update 3: Updated *unbuild_net.s* to work with the latest version of the travel model

1.3.3.1 Update type

Bug fix

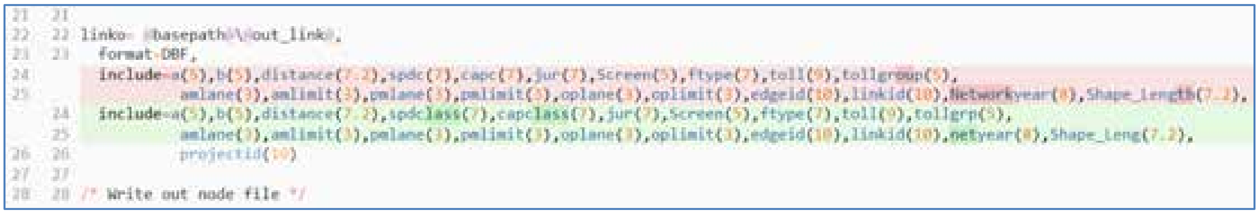
1.3.3.2 Effect on model results?

No

1.3.3.3 Description

Unbuild_net.s is a utility script, which is used to unbuild a highway network file from a Citilabs *NET* format to a link and a node file in *dbf* format. The script needed to be updated so that it would be in sync with recent changes that had been made to network attributes. This update did not change the modeled outputs. As one example of the changes, “spdc(7)” was changed to “spdclass(7)”.

Changes made to *unbuild_net.s*



```
linko=@basepath@\@out_link@,
  format=DBF,
  include=a(5),b(5),distance(7.2),spdc(7),capc(7),jur(7),Screen(5),ftype(7),toll(9),tollgroup(5),
          amlane(3),amlimit(3),pmlane(3),pmlimit(3),oplane(3),oplimit(3),edgeid(10),linkid(10),Networkyear(8),Shape_Length(7.2),
  include=a(5),b(5),distance(7.2),spdclass(7),capclass(7),jur(7),Screen(5),ftype(7),toll(9),tollgrp(5),
          amlane(3),amlimit(3),pmlane(3),pmlimit(3),oplane(3),oplimit(3),edgeid(10),linkid(10),netyear(8),Shape_Leng(7.2),
          projectid(10)

/* Write out node file */
```

Figure 6 Changes made to *Unbuild_net.s* to work with the latest version

1.3.4 Update 4: Removed Metrorail constraint procedure

1.3.4.1 Update type

New/improved feature (in response to recent changes in WMATA policy)

1.3.4.2 Effect on model results?

Removing the modeling procedure that implements the Metrorail constraint to/through the regional core did not affect model results for the years up through 2020. However, the update did change model results for the forecast scenarios after 2020. A sensitivity test of the update to the Ver. 2.3.70 Travel Model was made for a network representing year-2040 conditions (i.e., 2040_base and 2040_final). At the regional level, the changes in modeled results were considerable. For example, after the update, the 2040_final scenario saw an increase of the total number of regional transit person trips by 3%, a drop in auto person trips by 0.2%, and a decrease in total vehicle-miles of travel (VMT) by 0.1%. The removal of the Metrorail constraint resulted in increases of more than 5% for both regional Metrorail and Metrobus trips, which were mainly shifted from auto trips and commuter rail trips. The walk trips to Metrorail and Metrobus both gained about 5% after the update. At the sub-regional level, the update caused a similar impact. Specifically, the Metrorail trips coming from the regional non-core area destined to the regional core jumped 7%, which makes sense, since the Metrorail system has more capacity after the constraint removal. Since Metrorail is more attractive, the trips of commuter rail, a competitive mode, coming from the regional non-core area destined to core area fell 3%.

1.3.4.3 Description

The Metrorail constraint through the regional core (sometimes referred to as the "transit constraint through the regional core") is a technical adjustment to the trip tables coming out of the mode choice process designed to reflect a WMATA policy assumption that, during peak periods, the Metrorail system may have insufficient capacity to serve all the demand traveling to and through the regional core. Typically, it is assumed that the Metrorail system will be able to handle all of the peak-period demand to and through the regional core in the near term, but, since demand has historically grown over the long run,[16] the system might not be able to handle all the peak-period demand at some future time, depending on the amount of growth in demand and the number of rail cars available in a given year. The assumed year at which the Metrorail system will be at its peak capacity during the peak periods to and through the regional core is known as the "binding year." For years beyond the binding year, it is assumed that any growth in peak-period Metrorail demand to and through the regional core will be forced to switch to other travel modes (specifically, auto person trips). The Metrorail constraint was initiated by WMATA in 2000 to address funding shortfalls restricting the expansion of the rail fleet.[17] WMATA policy sets the binding year, which was set at 2020 in previous versions of COG/TPB Travel Model. This means that, for any forecast year past 2020, the Metrorail constraint was applied, i.e., any forecasted peak-period Metrorail trips that exceeded the 2020 demand to and through the regional core were shifted to other travel modes (specifically, auto person trips). Details about the Metrorail constraint through the regional core, including a definition of the extent of the regional core can be found in section 21.2 on page 159, which is part of the "mode choice" section of this report.

The recent legislation establishing stable long-term funding of $500 million a year for Metro will now support WMATA's plans to implement all 8-car trains during peak periods in the Visualize 2045 Plan.[18] Consequently, TPB approved the removal of the Metrorail constraint from the travel model process at the TPB meeting on May 16, 2018.

The transit constraint removal update changed the following components of the model:

Table 4 Affected model's components due to Update 4

File name	Changes
run_ModelSteps_[year]_Final.bat	Revised
Mode_Choice_TC_V23_Parallel.bat	Removed

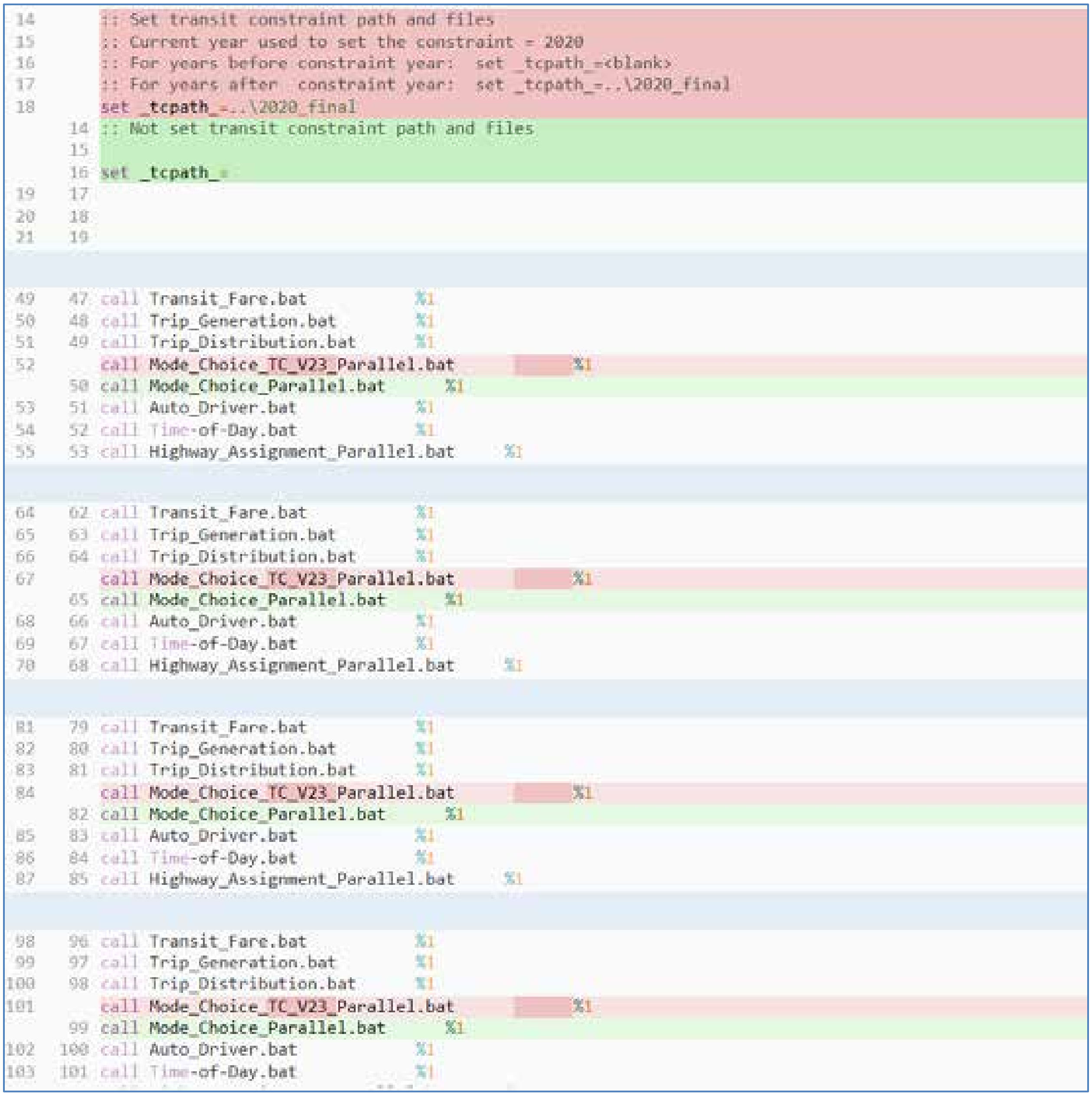
---

[16] In the shorter term, Metrorail ridership has decreased slightly between 2009 and 2017.

[17] Ronald Milone, "TPB Version 2.3 Travel Model on the 3,722-TAZ area system: Status report" (presented at the September 23, 2011 meeting of the Travel Forecasting Subcommittee of the Technical Committee of the National Capital Region Transportation Planning Board, held at the Metropolitan Washington Council of Governments, Washington, D.C., September 23, 2011).

[18] Jane Posey, "Amendments to the Visualize 2045 Air Quality Conformity Scope of Work," Memorandum, May 16, 2018.

Updates to *run_ModelSteps_[year]_Final.bat*



```
:: Set transit constraint path and files
:: Current year used to set the constraint = 2020
:: For years before constraint year:  set _tcpath_=<blank>
:: For years after  constraint year:  set _tcpath_=..\2020_final
set _tcpath_=..\2020_final
:: Not set transit constraint path and files

set _tcpath_=



call Transit_Fare.bat              %1
call Trip_Generation.bat           %1
call Trip_Distribution.bat         %1
call Mode_Choice_TC_V23_Parallel.bat          %1
call Mode_Choice_Parallel.bat         %1
call Auto_Driver.bat               %1
call Time-of-Day.bat               %1
call Highway_Assignment_Parallel.bat     %1

call Transit_Fare.bat              %1
call Trip_Generation.bat           %1
call Trip_Distribution.bat         %1
call Mode_Choice_TC_V23_Parallel.bat          %1
call Mode_Choice_Parallel.bat         %1
call Auto_Driver.bat               %1
call Time-of-Day.bat               %1
call Highway_Assignment_Parallel.bat     %1

call Transit_Fare.bat              %1
call Trip_Generation.bat           %1
call Trip_Distribution.bat         %1
call Mode_Choice_TC_V23_Parallel.bat          %1
call Mode_Choice_Parallel.bat         %1
call Auto_Driver.bat               %1
call Time-of-Day.bat               %1
call Highway_Assignment_Parallel.bat     %1

call Transit_Fare.bat              %1
call Trip_Generation.bat           %1
call Trip_Distribution.bat         %1
call Mode_Choice_TC_V23_Parallel.bat          %1
call Mode_Choice_Parallel.bat         %1
call Auto_Driver.bat               %1
call Time-of-Day.bat               %1
```

Figure 7 Changes made to *run_ModelSteps_[year]_Final.bat* to remove Metrorail Constraint procedure

2 Overview of the model

The TPB Version 2.3 family of travel models is a classic, aggregate, "four-step," trip-based, regional travel demand model. The four steps in a classic travel demand model are

- Trip generation
- Trip distribution
- Mode choice
- Traffic assignment[19]

The first three steps deal with estimating current-year or future-year demand for travel. The last step, traffic assignment, is where the demand for travel is assigned to a transportation network. This final step represents an equilibration between the transportation demand and the transportation supply. In many models, traffic assignment includes only a highway assignment, where private-use motor vehicles are assigned to a roadway network. In larger urban areas with extensive transit systems, there is often also a transit assignment, in addition to the highway assignment. The TPB travel model includes both a highway assignment and a transit assignment. So-called "four-step" models are trip based, meaning that trips are the basic unit of analysis, and are also "aggregate," meaning that the model represents aggregate person flows and aggregate vehicle flows between transportation analysis zones (TAZs). In other words, these models do not model trips that happen within an individual TAZ (intra-zonal trips) and they do not simulate the movement of individual people or individual vehicles.

A highway assignment can be conducted at one of three different scales: microscopic, mesoscopic, or macroscopic. The TPB Version 2.3 Travel Model highway assignment is a **macro**scopic, static traffic assignment. This is the standard practice for almost every four-step model used in the United States. To better understand the meaning of a **macro**scopic traffic assignment, it is useful to understand the two other scales of assignment: microscopic and mesoscopic. In a **micro**scopic traffic assignment, individual vehicles are modeled, using a small time-step, such as every second. In a **meso**scopic traffic assignment, platoons of vehicles are modeled, with a demand that varies though the assignment period (e.g., the AM peak hour demand is higher than the demand found in the shoulder hours of the AM peak period). By contrast, in a **macro**scopic traffic assignment, all traffic moving from one zone to another zone is modeled, but demand does not vary within the assignment period (e.g., a constant demand is assumed for all three hours in the AM peak period). Although it would seem appealing to use a microscopic or mesoscopic assignment in a regional travel demand model, these fine-grained assignments are almost never used in regional travel demand models since they would take too long to run and would require, at the regional level, too much input data (e.g., information about the traffic control devices and signal timings at every intersection). Thus, a macroscopic traffic assignment is usually the norm for regional travel demand models. As noted in a recent TRB report, "While there is much ongoing research into the

---

[19] The Version 2.3 family of travel models actually has six major steps. The two additional steps are "demographic sub-models" and the "time-of-day model." All six of these steps are described in section 2.3 of this report, beginning on page 6.

use of dynamic assignment and traffic simulation procedures, the state of the practice for regional travel models remains static equilibrium assignment."[20]

2.1 Model inputs

The major inputs and outputs of the regional travel demand model are shown in Figure 8.The travel model requires three major inputs:

- Zone-level land activity forecasts for year/scenario X;
- Transportation networks (both highway and transit) for year/scenario X; and
- Transportation policy assumptions for year/scenario X.

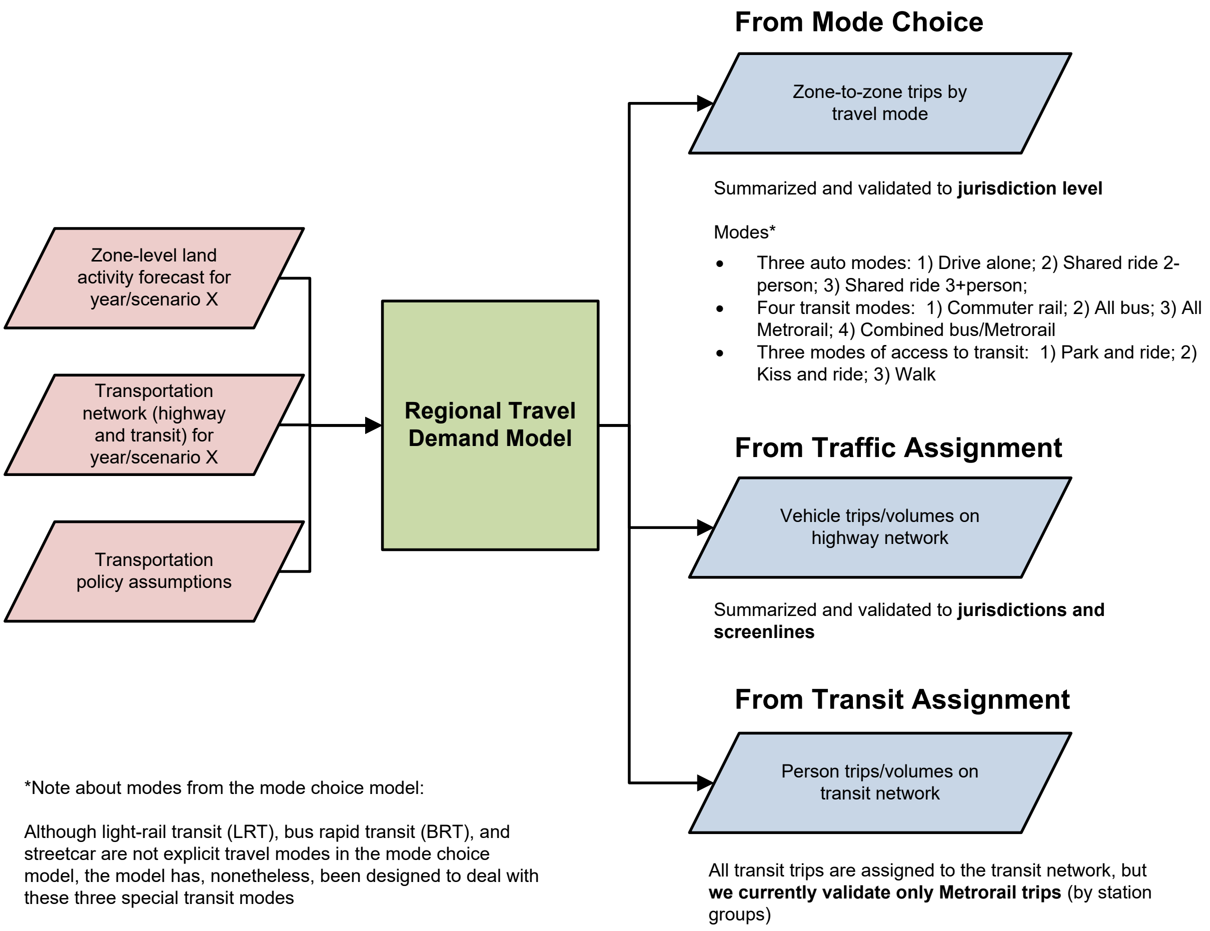


Figure 8 Major inputs and outputs of the TPB Version 2.3 Travel Model

Ref: travel_model_flowchart_overview_v3.vsd

---

[20] Cambridge Systematics, Inc. et al., *NCHRP Report 716: Travel Demand Forecasting: Parameters and Techniques*, National Cooperative Highway Research Program (Washington, D.C.: Transportation Research Board of the National Academies, 2012), 74, http://www.trb.org/Main/Blurbs/167055.aspx.

The zone-level land activity forecasts are developed by COG's Cooperative Forecasting Program, working through its Cooperative Forecasting and Data Subcommittee.[21] COG does not use a formal land use model. In the early 1970s, COG tried using a land use model called EMPIRIC,[22] but COG staff was not satisfied with its performance, and later abandoned its use.[23] Instead of a land use model, like many MPOs and regional planning agencies, COG uses a process, often known as a "modified Delphi process," which involves reconciling top-down and bottom-up land activity forecasts.[24] The top-down forecasts are regional econometric projections of employment, population, and households. The bottom-up forecasts are also projections of employment, population, and households, but made at the zone level and are based on information from the local governments. These bottom-up forecasts are derived from both building permits (providing short-term information) and comprehensive land use plans (providing long-term information). Each update of the zone-level, land activity forecasts in the Cooperative Forecasting program is called a "round" and the latest update is Round 9.1.

Before the zone-level land activity data can be used as an input to the travel model, it must undergo an adjustment process, known as the CTPP-based employment adjustment, which ensures that a consistent employment definition is used by all counties and jurisdictions in the modeled area. The reason for this adjustment is that different jurisdictions in the modeled area, which covers DC, Maryland, Virginia, and one county in West Virginia, use different definitions of employment. For example, jurisdictions in the Baltimore region and several other Maryland jurisdictions develop their base-year employment estimates using data from Bureau of Economic Analysis (BEA). By contrast, most of the jurisdictions in the Washington region develop their base-year employment estimates using data from the Quarterly Census of Employment and Wages (QCEW) collected by the Bureau of Labor Statistics (BLS).[25] The QCEW is a joint federal/state cooperative arrangement between the BLS and state employment security agencies (ESAs). According to Spear, "In lieu of using the publicly available QCEW database, some state DOTs (and even some MPOs) have entered into formal agreements with their state ESAs to obtain access to the enhanced QCEW microdata files that are used by BLS to develop the QCEW… [The QCEW files] are more commonly known in the transportation community as ES-202 data, but this terminology

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[21] "Cooperative Forecasting and Data Subcommittee," Metropolitan Washington Council of Governments, 2018, https://www.mwcog.org/committees/cooperative-forecasting-and-data-subcommittee/.

[22] Peat, Marwick, Mitchell and Company, "EMPIRIC Activity Allocation Model: Application to the Washington Metropolitan Region" (Metropolitan Washington Council of Governments, 1972).

[23] Reid Ewing and Keith Bartholomew, "Comparing Land Use Forecasting Methods: Expert Panel Versus Spatial Interaction Model," *Journal of the American Planning Association* 75, no. 3 (2009): 347.

[24] Paul DesJardin, "Round 8.4 Cooperative Forecasts" (March 18, 2015), https://www.mwcog.org/file.aspx?&A=OtImE2QWj1BO0DeQmbp6QUDb5wY6PX%2fzbRb%2bkgWDGhw%3d.

[25] Robert E. Griffiths to Ronald Milone, "Travel Model Employment Data Adjustment Factors for Round 7.0," Memorandum, August 10, 2005, 1.

is no longer used by BLS."[26] The most recent CTPP-based employment adjustment was conducted on Round 9.1 land activity data.[27]

As for the transportation networks, COG/TPB staff develops a series of highway and transit networks for the air quality conformity analysis, and these networks are often used as the starting point for other planning studies. The highway network consists of all freeways, expressways, and major arterials in the modeled area. It also includes many minor arterials and some collectors, but almost no local roads (centroid connectors represent local roads, but one centroid connector may represent many local roads, so there is not a one-to-one representation like one finds for other link types in the highway network). The highway network forms the base layer for the transit network, since buses mostly make use of the highway network. In addition to the highway network, the transit network includes the following elements:

- Transit infrastructure: Transit-only links
- Transfer links
- Transit service
- Transit fares

The latest full-scale documentation of the transportation networks was done in 2018.[28]

Transportation policy assumptions include the following:

- Assumptions about how transportation costs will increase over time, e.g.,
    - Will transit fares rise at the same rate as inflation or a different rate?
    - How will auto operating costs change over time?
- Cost of parking;
    - For drive-access transit trips, the cost of parking is stored in the station file. For park-and-ride (PNR)-to-station transfer links, the walk time is a function of parking capacity and parking cost,[29] but parking cost is not used as part of the transit path-building.
    - For driving trips not involving transit, a parking cost model is used, where parking cost is a function of employment density (see section 21.7.1 "Non-transit-related parking costs").

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[26] Bruce D. Spear, "NCHRP 08-36, Task 098: Improving Employment Data for Transportation Planning" (Washington, D.C.: American Association of State Highway and Transportation Officials (AASHTO), Standing Committee on Planning, September 2011), ES-7, http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP08-36(98)_FR.pdf.

[27] Hamid Humeida and Ray Ngo to Mark Moran et al., "Developing Land Use Input Files for the Version 2.3 Travel Model Using Round 9.1 Cooperative Forecasts and the CTPP-Based Employment Adjustment Factors," Memorandum, October 25, 2018.

[28] Meseret Seifu, Ron Milone, and Mark Moran, "Highway and Transit Networks from the VDOT and MDOT Off-Cycle Amendment to the 2016 CLRP (TPB Version 2.3.70 Travel Model)," Draft report, June 15, 2018.

[29] Manish Jain to Ronald Milone and Mark Moran, "MWCOG Network Coding Guide for Nested Logit Model (First Draft: September 20, 2007; Updated February 2008 and October 2010)," Memorandum, October 2010, 6.

- Amount of in-commuting from areas outside the modeled cordon.

2.2 Model outputs

The travel model produces a large number of outputs. **Each model run produces about 25 GB of output files**. Since many of these are intermediate files, a clean-up process has been added to the model that moves these intermediate/temporary files to a folder where they can be easily deleted. **Once these are deleted, the amount of output files per model run is about 10 GB**. As stated earlier, the travel model is an "aggregate" model meaning that the model represents aggregate person flows and aggregate vehicle flows between transportation analysis zones (TAZs). Nonetheless, the model produces many fine-grained outputs. These include link-level outputs, such as the number of vehicles traveling on a particular link in the AM peak period, and zone-interchange-level outputs, such as the number of bus person trips traveling from TAZ X to TAZ Y. However, although the model *produces* these fine-grained outputs, **the model has not been validated to these fine-grained levels, so it is not recommended that one use these fine-grained outputs from the travel model**. A general rule is that, before using or reporting any model outputs, they should be summarized or aggregated to the same, or a higher, level as was used in model validation. For example, although the model produces link-level traffic volumes, this information should be aggregated to the screenline level, jurisdiction level, or regional level, before it is used or reported. Despite this rule, these fine-grained outputs are sometimes used in corridor-level or project-level planning studies, but typically only after the outputs have undergone post-processing (see, for example the classic report NCHRP 255,[30] or its recent update, NCHRP 765[31]). Given the regional nature of most of the transportation planning studies conducted for the TPB, the COG/TPB staff rarely conducts this type of post-processing work (it is more commonly conducted by consultants working for local governments or state DOTs). In conclusion, when using outputs of the regional travel demand model, one should generally use outputs that have been aggregated or summarized to the following levels:

- Region level, e.g.,
    - The modeled area,
    - The TPB planning area,
    - The metropolitan statistical area (MSA), or
    - One of the air quality non-attainment areas, which can vary by pollutant.[32]
- Jurisdiction level
- Jurisdiction-to-jurisdiction level
- For highway assignments: Regional screenlines

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[30] Neil J. Pedersen and D. R. Samdahl, *NCHRP Report 255: Highway Traffic Data for Urbanized Area Project Planning and Design*, National Cooperative Highway Research Program (NCHRP) (Transportation Research Board, National Research Council, 1982), http://trid.trb.org/view/1982/M/188432.

[31] CDM Smith et al., *NCHRP Report 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design*, National Cooperative Highway Research Program (NCHRP) (Transportation Research Board of the National Academies, 2014).

[32] The modeled area is the largest of these regional areas.

- For transit assignments: Metrorail station groups

Figure 8 shows the three major outputs of the travel model, listing both the disaggregate-level output and the more aggregate-level output that is recommended for use. Table 5 adds some detail to the information found in Figure 8.

Table 5 Outputs of the travel model: Disaggregate-level output that is not validated versus aggregate-level output that is validated

Model producing the output	**Disaggregate-level output (Produced by the model, but not recommended for use)**	**Aggregate-level output (recommended for use)**
Mode choice	Zone-to-zone trips by travel mode	• Jurisdiction-to-jurisdiction flows • Jurisdiction-level mode spits • Region-level mode splits
Traffic assignment	Vehicle trips/volumes on the road links	• Jurisdiction-level metrics, such as VMT by jurisdiction • Screenline-level metrics, such as total number of vehicles crossing screenline
Transit assignment	Transit person trips/volumes on transit links	Although all transit person trips are assigned to the transit network, we currently validate only Metrorail trips, and these are validated only by station groups (generally three to four stations per group).

2.3 Modeling steps and the speed feedback loop

The major steps of the Version 2.3 Travel Model, including major inputs and outputs, can be found in Figure 9. As mentioned earlier, the major inputs are the transportation networks, the zonal land use data, and the transportation policy assumptions. The model itself, which is delineated in Figure 9 by a gray, dashed-line forming a box, begins with demographic models and ends with traffic assignment and transit assignment. Each of the steps of the travel model is discussed in subsequent chapters of the user's guide.

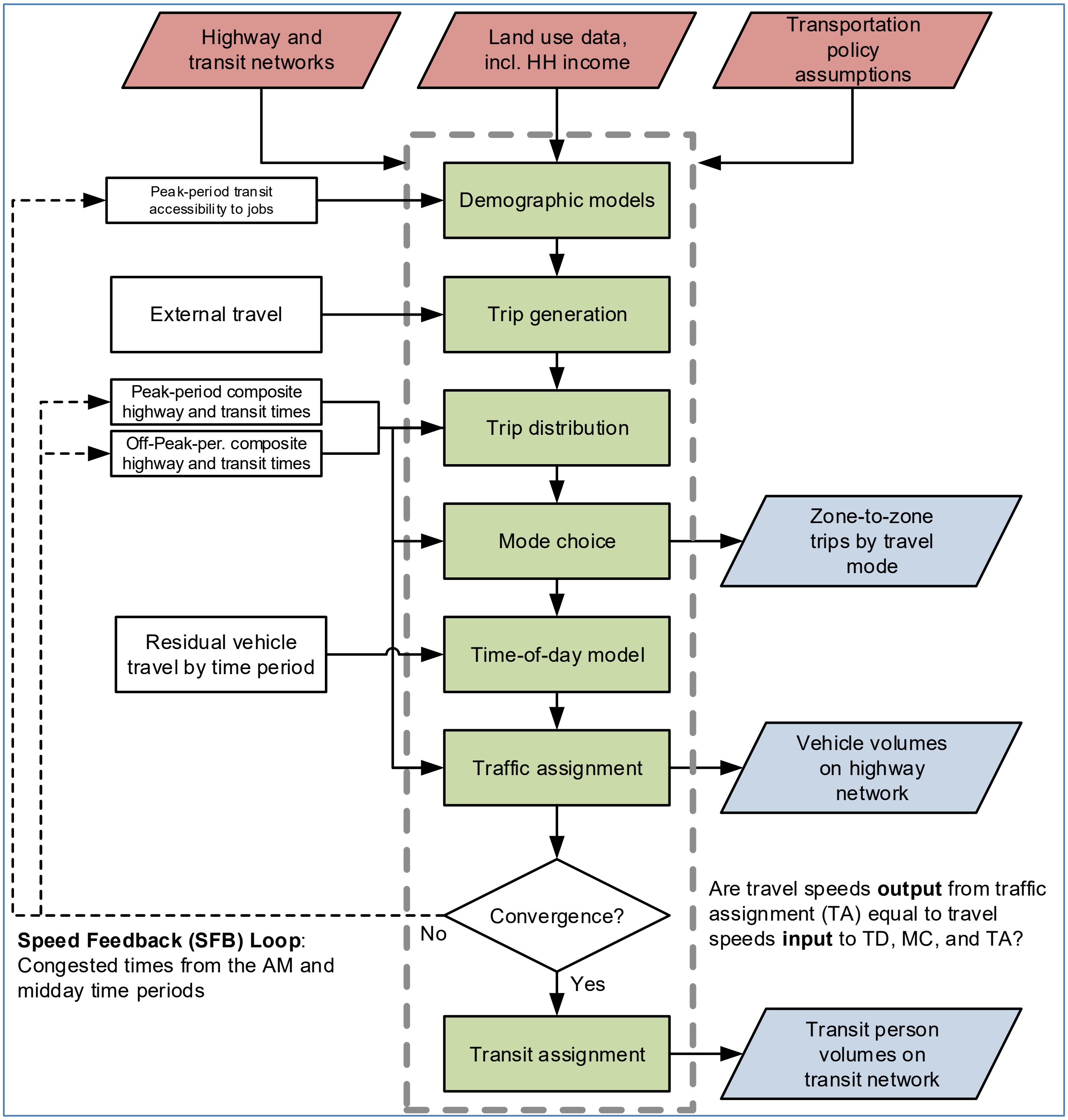

Figure 9 Major steps of the Version 2.3 Travel Model

Ref: six_step_model_ver2.3_v3.vsd

As can be seen in Figure 9, the Version 2.3 Travel Model uses a speed feedback (SFB) loop to ensure that the travel times (and hence speeds) coming out of traffic assignment are consistent with those used as inputs to trip distribution and mode choice. In theory, at the end of each SFB loop, the model would have a test to determine whether convergence has been met. In other words, one could continue running iterations of the speed feedback loop until a convergence stopping criterion has been met.

Currently, however, we do not use a convergence-based stopping criterion. Instead, based on past tests with the regional model, we have determined that the model is sufficiently converged after four SFB iterations,[33] so we simply use a fixed number of SFB loop iterations (five iterations, including the initialization iteration, known as the "pump prime" iteration). In the future, we may use a more formal convergence-based stopping criterion for the SFB loop, such as the percent root-mean-square error (%RMSE) of the travel skims.[34] Nonetheless, in 2011, Cambridge Systematics was unable to find any MPOs that used a formal stopping criterion for the SFB loop.[35] The SFB loop and the volume averaging method used in the SFB loop are discussed in more detail later in this section.

Traffic assignment is discussed both here and in its own chapter (Chapter 23). Like most travel models in the U.S., the Version 2.3 Travel Model uses a user-equilibrium (UE) traffic assignment, which is the generally accepted method for static traffic assignments. Furthermore, the assignment process is a multi-class UE assignment, meaning that separate user classes can be assigned at the same time. The Version 2.3 model includes six user classes:

1. Single-occupant vehicle (SOV)
2. High-occupant vehicle with two persons (HOV2)
3. High-occupant vehicle with three+ persons (HOV3+)
4. Medium and heavy trucks
5. Commercial vehicles
6. Airport passengers traveling to/from the three commercial airports

Additionally, the Version 2.3 model includes four time-of-day periods for traffic assignment:

- AM peak period (3 hours: 6:00 AM to 9:00 AM)
- Midday period (6 hours: 9:00 AM to 3:00 PM)
- PM peak period (4 hours: 3:00 PM to 7:00 PM)
- Night/early morning period (11 hours: 7:00 PM to 6:00 AM)

Most MPOs use a UE traffic assignment that relies on an optimization algorithm known as the Frank-Wolfe (FW) algorithm.[36] The FW algorithm is essentially a series of all-or-nothing traffic assignments where flows are combined using weights from an optimization process whose goal is to minimize an objective function. The process stops when a stopping criterion is met. Previously, the Version 2.3 Travel

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[33] Ron Milone, "TPB Models Development Status Report," (January 23, 2009), https://www.mwcog.org/file.aspx?&A=%2fTnLbhiKP7J4dc5BCvLqxHQzO%2bq9WHN4K%2bDGCm64j8s%3d.

[34] See, for example, Caliper Corporation, "Traffic Assignment and Feedback Research to Support Improved Travel Forecasting," Final Report (Washington, D.C.: Federal Transit Administration, Office of Planning and Environment, July 31, 2015), pages 3-2 and 3–4, http://www.fta.dot.gov/documents/traffic-assignment-and-feedback-research-to-support-improved-travel-forecasting.pdf.

[35] Cambridge Systematics, Inc., "Fiscal Year 2010 Task Reports," Final Report (Washington, D.C.: National Capital Region Transportation Planning Board, November 16, 2010), 1–20 to 1–21, http://www.mwcog.org/transportation/activities/models/review.asp.

[36] Marguerite Frank and Philip Wolfe, "An Algorithm for Quadratic Programming," *Naval Research Logistics Quarterly* 3, no. 1–2 (1956): 95–110, https://doi.org/10.1002/nav.3800030109.

Model used the following UE stopping criterion: When the relative gap ≤ 10^{-3} OR the number of UE iterations ≥ 300. The relative gap threshold was always intended to be the primary stopping criterion, with the number of UE iterations functioning as a backup criterion. Now, however, we have moved to what we call a "progressive" relative gap stopping criterion. The idea is that, in the early SFB iterations, the UE closure criterion will be relatively loose, but, in the later SFB iterations, the UE closure criterion will tighten, as shown in Table 6.

Table 6 User equilibrium closure criterion (relative gap) varies by speed feedback iteration

Speed feedback iteration	**Primary closure criterion for UE traffic assignment**	**Secondary closure criteria for UE traffic assignment**
Pump prime	Relative gap ≤ 10^{-2} (i.e., 0.01)	Number of UE iterations ≥ 1000
1	Relative gap ≤ 10^{-2} (i.e., 0.01)	Number of UE iterations ≥ 1000
2	Relative gap ≤ 10^{-2} (i.e., 0.01)	Number of UE iterations ≥ 1000
3	Relative gap ≤ 10^{-3} (i.e., 0.001)	Number of UE iterations ≥ 1000
4	Relative gap ≤ 10^{-4} (i.e., 0.0001)	Number of UE iterations ≥ 1000

By using the higher value for UE iterations (1000 vs. 300), we were able to ensure that this secondary criterion is unlikely to be used as the stopping criterion. Based on a series of sensitivity tests,[37] we found that the new progressive relative gap scheme results in a relatively converged traffic assignment, without the extremely lengthy model run times that would be needed if one were to use a high threshold (e.g., 10^{-4} relative gap) for each of the five SFB iterations. The Version 2.3 Travel Model uses a slight variation of the FW algorithm, called the *bi-conjugate* Frank-Wolfe algorithm, which converges marginally faster than the classic FW algorithm.

Regarding data inputs, the zonal land use data that is input to the travel model (Figure 9) includes information about average household wealth, in the form of an average household income index. This index is the ratio of the zonal median household income to the regional median household income, in year-2007 dollars. So-called "residual vehicle" or exogenous trips are added to the modeling stream at the time-of-day model stage. These trips include

- Through trips (auto and truck);
- Taxi trips;
- School trips;
- Visitor/tourist trips;
- Airport passenger trips (i.e., trips by air passengers destined to the three commercial airports in the region).

Figure 10 is another view of the Version 2.3 Travel Model, but with an emphasis on which steps occur *before* the speed feedback (SFB) loop and which steps occur *within* the SFB loop. Before the loop is

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[37] Mark S. Moran and Ronald Milone, "Status Report on the Version 2.3 Travel Model: Updates to the Model and Year-2010 Validation" (March 22, 2013), 7–11.

begun, there is an initialization phase, known as the “pump-prime” iteration. In the pump prime iteration, a first pass of the travel model is performed using *initial* AM and off-peak highway speeds, and *initial* mode choice percentages (i.e., the mode choice model is not executed in the pump prime iteration). The “skimmed” highway times are used to develop drive-access-to-transit (zone-to-PNR-lot) links as part of the transit network. After the transit network is built and skimmed, trip generation and trip distribution are executed. The resulting person trips are converted to vehicle trips on the basis of default zone-level mode choice and car occupancy percentages, and these are assigned to the highway network.

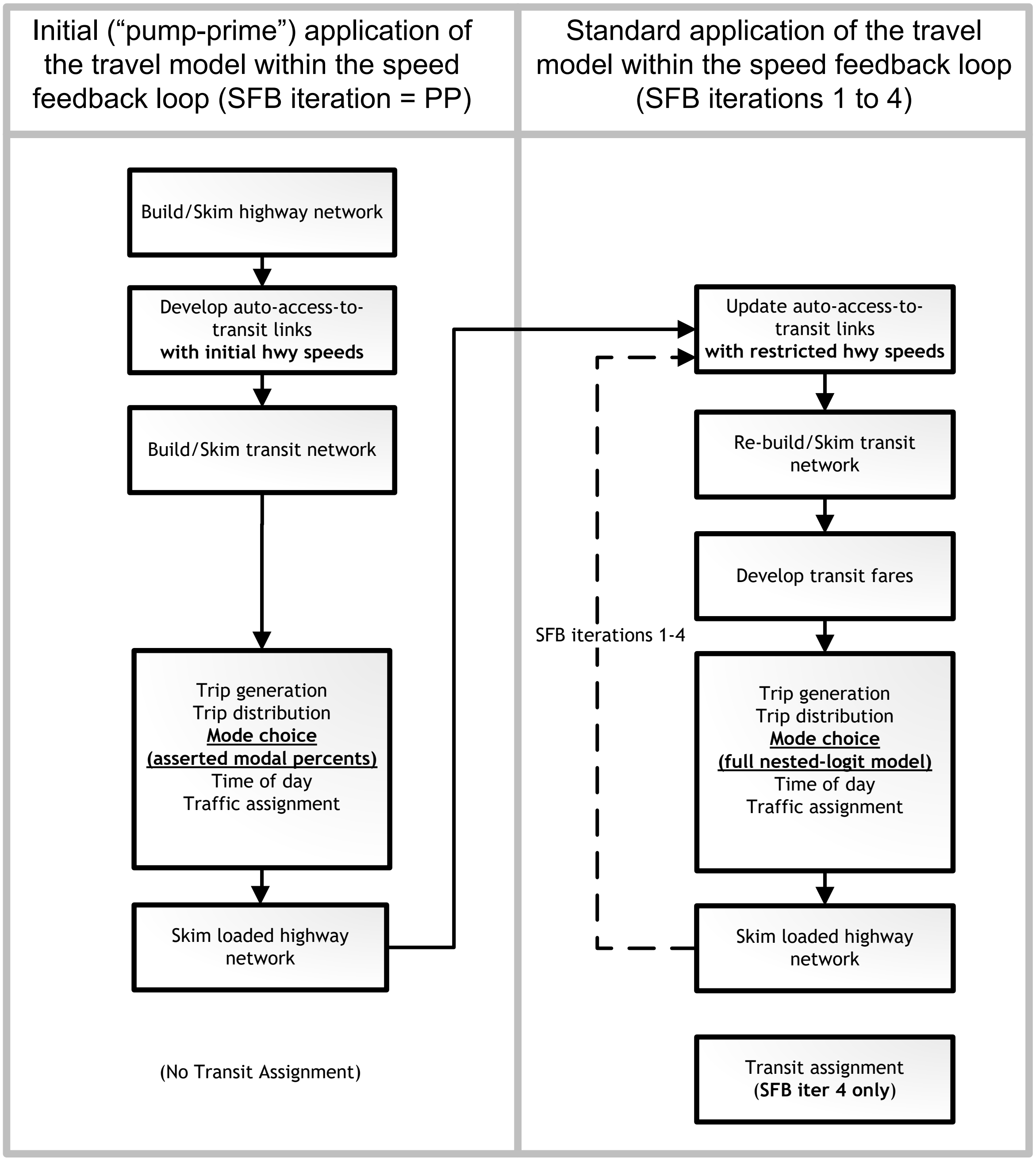

Figure 10 Application process of the Version 2.3 Travel Model

Ref: pumpPrime_vs_other_sfb_iter_v5.vsd

The next series of "standard" SFB iterations (1 through 4) involve the execution of the complete travel model which includes: 1) a mode choice model execution and 2) the use of recycled traffic assignment-based speeds as input. The AM peak and off-peak restrained highway times are used to update the zone-to-PNR link speeds, and the transit network is re-built and skimmed. The highway and transit time skims are used as inputs to the mode choice model. The auto driver trips produced from the mode choice model are processed through the time-of-day model, which apportions the auto drivers among four time-of-day periods: the AM peak period (6 - 9 AM), the midday period (9 AM - 3 PM), the PM peak period (3 - 7 PM), and the night/early morning period (7 PM - 6 AM). The four time-of-day trip tables are subsequently loaded onto the highway network in separate traffic assignment procedures. The loaded-link volumes are successively averaged using the method of successive averages (MSA) to facilitate the convergence of the final link speeds. The averaging occurs individually for each of the four time-of-day periods at the link level, as follows:

- The "final" first iteration link volumes are equal to the "raw" assigned link volumes from the pump-prime iteration.
- The "final" second iteration link volume equals one half of the first iteration link volume plus one half of the second iteration assigned link volume.
- The "final" third iteration link volume equals 2/3 of the "final" second iteration link volume plus 1/3 of the third iteration assigned volume.
- The "final" fourth iteration volume is not averaged -- it is the direct assignment output.

In both the Version 2.2 and 2.3 travel models, a fixed number of speed-feedback (SFB) iterations is used. The Version 2.2 model used six speed feedback iterations (in addition to the pump prime iteration). By contrast, the Version 2.3 model uses four speed feedback iterations (in addition to the pump prime iteration). The Version 2.3 model produces **two final loaded network files** called **i4_Assign_Output.net** and **i4_HWY.NET** (not i6hwy.net, as was the case with the Version 2.2 Travel Model). The first file (**i4_Assign_Output.net**) is based on the direct trip table output, while **i4_HWY.NET** is based on volume averaging. TPB staff use **i4_Assign_Output.net** to compute the emissions as a part of air quality conformity and work for the state air quality implementation plans (SIPs).

As shown in both Figure 9 and Figure 10, transit assignment is not conducted within each speed feedback loop, but is instead conducted once, after the final feedback iteration is complete. Transit assignment is conducted for two time-of-day periods (peak and off-peak) using trip tables in production/attraction (P/A) format (not origin/destination format, as is the case for highway assignment) and, unlike highway assignment, transit assignment is not capacity constrained. Although both these aspects of transit assignment may seem like shortcomings, the state of the practice for regional transit assignments is P/A assignment without capacity constraint.[38]

2.4 Special modeling procedures used in earlier versions of the travel model

Historically, there have been two transportation phenomena that have required specialized modeling procedures. The two phenomena were 1) Limited capacity on the Metrorail system to handle the demand for travel to and through the regional core and 2) High Occupancy/Toll (HOT) lanes.

The first phenomenon, a limit on Metrorail's peak-period capacity, was modeled using a procedure called the Metrorail constraint to and through the regional core. This modeling technique was used from about 2001 to 2018. In 2018, however, WMATA received new dedicated funding from the District, Northern Virginia, and suburban Maryland, which meant that the transit authority would likely have the

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[38] See, for example, Cambridge Systematics, Inc. et al., *NCHRP 716*, 77.

funds to handle its peak volumes to/through the regional core. Thus, in 2018, WMATA requested that this procedure stop being used. The last model to use this procedure was the Ver. 2.3.70 Model.

The second phenomenon, HOT-lanes, is still in effect and will be for the foreseeable future, but the technique for modeling it has been changed in the Ver. 2.3.75 Model. In the Ver. 2.3.70 Model, and older model versions, a special procedure was used, known as the HOV3+ highway skim replacement (HSR) procedure or the multi-run traffic assignment procedure.

As discussed in Section 1.3, starting with the Ver 2.3.75 Model, both the Metrorail constraint and the HSR procedure have been eliminated. Nonetheless, the Ver. 2.3.75 model still includes two special modeling procedures, which are not used for general application of the model, but can be used when the need arises. One is estimating toll values on HOT-lane facilities. The other is for performing select-link analyses. Both special procedures are described below.

2.4.1 Toll estimation for high occupancy/toll (HOT) lanes

According to a recent FHWA report, " 'Managed lanes' are defined as highway facilities or a set of lanes where operational strategies are proactively implemented and managed in response to changing conditions….Examples of operating managed lane projects include high-occupancy vehicle (HOV) lanes, value priced lanes, high-occupancy toll (HOT) lanes, or exclusive or special use lanes."[39] Most HOT lane facilities exist on freeways which include one or more adjacent general purpose (GP) lanes that are not managed.

2.4.1.1 HOT lanes which allow free use with 3+ occupants per vehicle

On Nov. 17, 2012, HOT lanes, known as the I-495 Express Lanes, opened on I-495 in Virginia. On this facility, vehicles with three or more occupants (HOV3+) may use the facility for free, but single-occupant vehicles (SOVs) and two-occupant vehicles (HOV2) must pay a toll to use the facility. The toll is dynamically set, every six minutes or so, based on congestion levels. The toll is set such that the HOT lanes will remain free flowing. In December 2014, HOT lanes, known as the I-95 Express Lanes, opened on I-95. This second facility also had the same HOV restriction (HOV3+), so both facilities are HOT3+.

Given the advantageous treatments in favor of HOV3+ traffic, such as the fact that HOV3+ vehicles are not charged tolls like non-HOV3+ (in both mode choice and traffic assignment), staff decided to eliminated the HSR procedure.[40] Obviously, a central modeling objective in representing HOT lanes is to specify detailed toll rates that will result in demand levels that do not degrade the prevailing speed on the HOT facility. To achieve this objective, the following <u>three steps</u> (reduced from four steps in previous model versions when HSR procedure was used) <u>are implemented in the Ver. 2.3.75 model</u> on a year-by-year basis to perform toll setting (i.e., estimate toll values) on HOT lanes. Note that the toll-setting

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[39] FHWA, "Managed Lanes: A Primer" (Washington, D.C.: U.S. Department of Transportation, Federal Highway Administration, 2008), 5, http://www.ops.fhwa.dot.gov/publications/managelanes_primer/managed_lanes_primer.pdf.

[40] Feng Xie and Dusan Vuksan to Files, "Evaluating the Modeling Effects of Eliminating the 'HOV Skim Replacement' Process."

procedure is conducted by TPB staff. Thus, many users of the TPB model never perform this step (since the estimated toll values for future-year networks are provided as part of the model transmittal package). For those with an interest in the current toll-setting procedure, please consult the 2018 memo cited here and earlier.[41]

2.4.1.2 HOT lanes which allow free use with 2+ occupants per vehicle

VDOT is recommending managing the I-66 HOT lanes inside the Beltway as a HOT2+ facility beginning in 2017 and continuing through 2020. Before this point, the only HOT lane facilities in the region were HOT3+. The Air Quality Conformity Analysis for Visualize 2045 includes six analysis years: 2019, 2021, 2025, 2030, 2040, and 2045. Among those years, only 2019 contains the HOT2+ facility of I-66 HOT lanes inside the Beltway. Since the HSR procedure has been removed, the similar three steps discussed in section 2.4.1.1 are implemented in Ver 2.3.75 for year-2019 to simulate HOT lanes. The only difference is that HOV2+ traffic is free to operate on HOT2+ facility, thus HOV2+ skims developed in Step 2 will be used in Step 3.

Please also see the discussion of the treatment of airport passenger auto driver trips on HOV- and HOT-lane facilities in section 23.3.8 (p. 204).

2.4.2 Select-link analyses

A select-link analysis (SLA) and a select-link assignment are common procedures in travel demand modeling, but these are not part of our standard modeling procedures. There are theoretical reasons why SLAs should not be performed,[42] but we often get requests for help with running SLAs. COG/TPB staff has developed some SLA procedures[43] for the Ver. 2.3 travel model, which may be requested by outside parties in the normal fashion (see https://www.mwcog.org/transportation/data-and-tools/modeling/data-requests/).

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[41] Feng Xie and Dusan Vuksan to Files, "Evaluating the Modeling Effects of Eliminating the 'HOV Skim Replacement' Process," Memorandum, March 7, 2018.

[42] See, for example, Hillel Bar-Gera and Amos Luzon, "Non-Unique Solutions of User-Equilibrium Assignments and Their Practical Implications," in *Compendium of Papers CD-ROM* (Transportation Research Board 86th Annual Meeting, held January 21-25, 2007, Washington, D.C., 2007).

[43] Feng Xie to Files, "Select Link Analysis for TPB's Version 2.3.70 Travel Demand Model," Memorandum, September 14, 2018.

3 Hardware and software requirements

This section of the report describes the hardware and software requirements for running the Version 2.3 family of travel models, with an emphasis on the Ver. 2.3.75 model. It also includes a section discussing the hardware used for modeling at COG. In addition to requirements, this section of the report also discusses any recommendations regarding hardware and software.

3.1 Hardware

- Processor/central processing unit (CPU)/chip:
    - Intel or Intel-like processor, e.g., Intel, AMD, with 64-bit architecture ("x64").
    - Number of cores: The Version 2.3.75 Travel Model has been designed to run some steps in parallel, using Cube Cluster.
        - During the highway assignment step, there can be up to 8 concurrent program threads running at once, which means that it is recommended that you have a computer with 8 or more cores. Nonetheless, you can run the regional travel model on a computer with only 4 or 2 cores (see instructions found in Table 19 on p. 84), however, due to rounding issues in Cube Cluster, running with fewer than the recommended 8 cores may result in slight differences in modeled results.
        - The two biggest chip manufacturers are Intel and AMD. Some Intel chips feature a technology known as Hyper-Threading. When Hyper-Threading technology is enabled on the chip, the operating system sees double the number of cores. So, if your computer has four cores and Hyper-Threading is enabled, the operating system will see eight virtual cores, thus doubling your CPU capacity. See the section 8.2.1 for more details. COG/TPB staff has executed the Version 2.3 family of travel models on only computers running Intel chips, but the model should run equally well on computers running AMD chips.
    - Chip/CPU speed: While there is no minimum chip speed, we have found that model run time scales inversely with chip speed, so a faster chip/CPU is always preferred. We recommend a chip speed of around 3 GHz.
- Memory: 64-bit versions of Windows can a large amount of memory (e.g., from 128 GB on Windows 10 Home to 2 TB on Windows 10 Pro). However, based on experience, running the Ver. 2.3 model runs is not memory intensive, so 3 to 4 GB of RAM should suffice. Some of our current travel mode servers have 32 GB of RAM, but, again, this does not seem to be needed for the current, trip-based model.
- Storage space: We recommend you have at least 500 GB of free space on your computer storage -- hard disk drive (HDD) or solid-state drive (SSD). One modeling scenario/year generates about 25 GB of files (1,600 files) before the clean-up procedure is run, and about 10 GB of files after the clean-up procedure is run. A solid-state drive (SSD) could provide shorter model run times, but in one test we performed on a new travel model server, the SSD

performed no better than the hard drive.[44] This result was unexpected, since one would generally expect an SSD to out-perform an HDD. In this test, the data drive was an SSD and the operating system (O/S) drive was a HDD. We did not, however, have time to test the case where both the data drive and the O/S drive were SSDs.

3.2 Software

- Operating system: Microsoft Windows (64-bit version), such as Windows 10, Windows Server 2008, or Windows Server 2012. To our knowledge, the Ver. 2.3.75 model has not been tested at COG using Windows 10, but it should work.
- The Version 2.3.75 Travel Model: This is provided for free to those who request it. The procedures for requesting the model can be found on the "Data Requests" webpage (https://www.mwcog.org/transportation/data-and-tools/modeling/data-requests/). In short, one needs to send an e-mail or a signed letter to Ronald Milone, Director of Travel Forecasting and Emissions Analysis, in COG's Department of Transportation Planning. The e-mail/letter should indicate how you intend to use the model, naming the specific study or research project, if applicable. When someone is given the TPB travel model, this includes the model inputs (principally transportation networks and land use data), batch files, Cube Voyager scripts, and the Fortran program used to run the mode choice model. Although Cube Voyager scripts are part of the model transmittal package, you cannot run these scripts without having a copy of Cube Voyager software (see below). Please note that the COG/TPB staff does not have the resources to staff a "help desk" for the regional travel model, so it is expected that individuals who request the travel model will have the knowledge and skills to use the model with minimal assistance from COG/TPB staff.
- Citilabs Cube software: The TPB Version 2.3.75 Travel Model is implemented using Citilabs Cube software, a proprietary software package, which is produced, licensed, and marketed by Citilabs, Inc. Thus, to run the regional travel model, you will need to purchase the Cube software from Citilabs (www.citilabs.com). COG/TPB staff cannot provide copies of the Citilabs Cube software.
    - Cube Base: Cube Base is the graphical user interface (GUI) for editing transportation networks, matrices, and scripts. In theory, Cube Base can also be used for managing network scenarios (Scenario Manager) and running travel models (Application Manager), but that is not how the Version 2.3 family of travel model have been implemented. Instead, the Version 2.3 model is implemented using a command-line interface (CLI), as described later in this report. **Note that Cube Base is 32-bit software (Cube Voyager is 64 bit)**.
    - Cube Voyager: Cube Voyager is the numerical engine that powers the Cube suite of software and includes its own proprietary scripting language. The Version 2.3.75 Travel Model has been developed and applied by COG/TPB staff using **Cube versions 6.4.1, so it is recommended you use Cube 6.4.1 with the Ver. 2.3.75 Model**. As noted above,

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[44] Dzung Ngo and Mark S. Moran to Ronald Milone et al., "Benchmark Tests on Travel Model Server #7 (Tms7) to Determine the Configuration for the Server's Hard Drives and the Potential Use of Cube's 64-Bit Version," Memorandum, February 2, 2016, 8.

Cube Voyager is 64-bit software. In the past, we noted that Cube Voyager 6.4.2 was less stable when running the ArcPy transit walkshed process. [45] For the transmittal version of the Ver. 2.3.75 model, we plan to "comment out" the automated ArcPy transit walkshed process as we did in Ver. 2.3.70,[46] since most users do not need to re-run this step (the output file from this process, areawalk.txt, is delivered with the model transmittal package). From our past experience, the automated ArcPy transit walkshed process is the modeling step that is most likely to result in the model run stopping prematurely. If a model user wants to make changes to the transit network, then they are recommended to uncomment the statement that calls this procedure, allowing the procedure to run as one of the first steps of the model.

  - Cube Cluster: Cube Cluster is Citilabs' implementation of distributed processing, which is a technique for distributing computing jobs across multiple computers or processors, thus reducing model run times by allowing two or more processes to run in parallel. Strictly speaking, Cube Cluster is not required to run the Version 2.3 Travel Model. But it is strongly recommended, in order to keep model run times to a minimum, and, if you choose not to use it, you will have to modify the model setups that are supplied by COG/TPB staff (this is described later in this report).

- ArcGIS Engine Runtime 10.1 or 10.3.1 or ArcGIS 10.1. ArcGIS Engine Runtime 10.3.1 comes with Cube 6.4.1. When installing Cube, the software installation process will check to see if ArcGIS has already been installed on your computer. See Table 20 on p. 98 for more information. The easiest setup would be to install Cube on a computer that does not have ArcGIS.
- A text editor (optional but recommended): The choice of which text editor to use is a personal one. Cube Base includes its own text editor, optimized, obviously, for editing Cube Voyager scripts. In addition to the Cube Base built-in text editor, COG staff uses one or more of the of the following: Notepad++ (free and open source), PSPad (free, but not open source), KEDIT (for purchase, though the software may no longer be supported by the vendor).
- Software for comparing or diffing text files (not required but recommended). COG staff uses both WinDiff, which is older, and WinMerge, which is newer and has more functionality. Both are available for free.
- Cygwin (optional, http://www.cygwin.com/) is a Linux-like environment for Windows that provides a series of Unix-like command-line tools, such as head, tail, and which. This free and open source software **is no longer part of the model stream, so users no longer need to install this** (though some users may still choose to install this software to get access to its suite of Unix-like utility commands).

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[45] Mark Moran, Ron Milone, and Meseret Seifu, "User's Guide for the COG/ TPB Travel Demand Forecasting Model, Version 2.3.70. Volume 1 of 2: Main Report and Appendix A (Flowcharts)," November 28, 2017, https://www.mwcog.org/assets/1/6/mwcog_tpb_travel_model_v2.3.70_user_guide_v7_appA_flowch.pdf.

[46] In the run_ModelSteps_*.bat batch file, the line "call ArcPy_Walkshed_Process.bat %1" should have "REM" at the beginning of the line to comment out this step.

3.3 Examples of computer hardware used at COG for modeling

COG/TPB staff performs most modeling runs on computer servers that are dedicated for this task, though one can also run the travel model on a standard, desktop computer. COG/TPB staff typically accesses a travel model server (TMS) using a Remote Desktop Connection. We currently have five travel model servers, named tms4, tms5, tms6, tms7, and tms8. Tms8 is the most recent travel model server at COG. Currently, COG's Models Applications Group makes use of tms4, tms6, and tms7 and COG's Models Development Group makes use of tms5 and tms8.

Table 7 compares the computer specifications ("specs") of the latest travel model servers used by the Models Development Group (tms8) and the Models Applications Group (tms7). Both computers are running 64-bit versions of Windows Server 2012 R2 Standard.

Table 7 Comparison of computer specs between tms7 and tms8

Host Name:	**Tms7**	**Tms8**
OS Name:	MS Windows Server 2012 R2 Standard	MS Windows Server 2012 R2 Standard
OS Version:	6.3.9600 Build 9600	6.3.9600 Build 9600
System Manufacturer:	HP	HP
System Model:	ProLiant DL380 Gen9	ProLiant DL380 Gen10
System Type:	64-bit	64-bit
Number of processors:	2	2
Processor name(s):	Intel Xeon E5-2687W V3	Intel Xeon Gold 6146
Clock speed of processor (GHz):	3.10	3.20
No. of cores/processor:	10	12
No. of threads/processor:	20	24
Total number of cores:	20	24
Total number of threads:	40	48
Hyper-Threading Technology:	Yes	Yes
Total Physical Memory (MB):	32,640 MB	65,196 MB
Hard drives for data storage:		Total 6 disks for drives C & F
	Local Disk (C:), 1 TB, RAID 1 (2 disks)	Local Disk (C:), 325 GB, RAID 10
	Data (E:), 3.27 TB, RAID 5 (4 disks)	**Data (F:), 4.04 TB, RAID 10**
	SSD (F:), 186 GB, RAID 0 (for testing)	

Ref: " I:\ateam\docum\fy19\memos\travel_model_server_tms_specs_2018.xlsx"

On a 64-bit computer with a 64-bit version of windows, some applications are 32-bit applications whereas others are native 64-bit applications, and each type of application has its own installation folder, as shown below:

- Installation location for 64-bit applications: "C:\Program Files"
  - Example: Cube Voyager

- Installation location for 32-bit applications: "C:\Program Files (x86)"
    - Examples: Cube Base, WinMerge

Although both tms7 and tms8 have two processors, tms7 has 10 cores per processor, resulting in a total of 20 physical cores. By contrast, tms8 has 12 cores per processor, resulting in a total of 24 physical cores. Because of Intel's Hyper Threading Technology, each server appears (to the operating system) to have double the number of cores. Thus, tms7 appears to the operating system as 40 virtual cores (which can handle 40 threads of instruction) and tms8 appears to the operating system as 48 virtual cores (which can handle 48 threads of instruction). The processor clock speeds for tms7 and tms8 are 3.1 GHz and 3.2 GHz, respectively. Regarding total physical memory, tms8 has 64 GB of RAM, double the size of tms7's RAM.

One can use the total number of cores in a computer to determine the maximum number of concurrent model runs that can be conducted. Since the Version 2.3.75 model is set up to use a maximum of 8 threads/cores, three concurrent model runs require the simultaneous use of 24 (= 3 x 8) cores. Four concurrent model runs could require up to 32 (= 4 x 8) cores. In tests conducted on tms6, which has 32 virtual cores ("threads"), TPB staff found that we could run four concurrent model runs of the Ver. 2.3.57 model (the results should apply to the Ver. 2.3.75 model as well). However, In the past, using Cube 6.1 SP1, we had found that, if two or more users tried to launch concurrent model runs, even if there were only two users, each with one model run, then one of the two model runs would often crash.[47] However, **under Cube 6.4.1, we found that two or three users can submit concurrent model runs**.[48] This is one improvement of Cube 6.4.1. For users who are running the automated ArcPy transit walkshed process, it is still necessary to use a 45-minute offset for launching model runs, so that only one instance of ArcGIS is running at a time. Also, based on recent communications with Citilabs (personal communication, 2/6/17), it is better not to overload the processor, so, although a 32-core computer should be able to run 4 concurrent model runs (4 x 8 = 32), it would be better to limit this computer to 3 concurrent model runs. It is hoped that further information about this issue will be added to future Cube documentation.

Travel model servers often have two logical disk drives: one containing the software, usually called "C:", and one used to store data, such as the model runs. Each one of these logical disks could actually be one or more disks, storage arrays, or, conceivably, solid state drives. The data drives associated with the travel model servers at COG are shown in Table 8.

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[47] Mark S. Moran and Dzung Ngo to Ronald Milone et al., "Stress Tests of Travel Model Server #6 (Tms6) to Determine the Maximum Number of Model Runs That Can Run Concurrently," Memorandum, October 29, 2014.

[48] Dzung Ngo to Mark S. Moran et al., "Testing the COG/TPB Travel Model Servers: 1) Need for Admin Privileges; 2) Ability to Run Two or More Concurrent Model Runs by Two or More Users; 3) Experience with Malware," Memorandum, June 6, 2017, 5.

Table 8 Computer storage drives used for travel demand modeling

Server	UNC Path	Mapped Drive Letter	Size	Drive Setup
nas	\\nas\TMSARCHIVE\MODELAPP	N:	13.9 TB	RAID 5
nas	\\nas\TMSARCHIVE\MODELDEV	O:	13.9 TB	RAID 5
sas	\\sas\dtp_sas$	S:	649 GB	VM. Gets storage from the SAN.
tms4	\\tms4\D	Y:	2.4 TB	RAID 5
tms5	\\tms5\E	X:	4.5 TB	RAID 5
tms6	\\tms6\ateam	L:	2 TB	RAID 0
tms6	\\tms6\bteam	P:	2 TB	RAID 0
tms6	\\tms6\ateamarray	T:	10 TB	RAID 5 DAS
tms6	\\tms6\bteamarray	V:	10 TB	RAID 5 DAS
tms7	\\tms7\Data	M:	3.3 TB	RAID 5 (4 disks)
tms8	\\tms8\F	Z:	4 TB	RAID 10

Ref: " I:\ateam\docum\fy19\tpb_tdfm_gen2\ver2.3\travel_model_user_guide\mapped_drives_cog_2018.xlsx"

For example, tms4 has one data drive with a capacity of 2.4 TB. This drive is mapped as the D drive when logged on to tms4 and is mapped to the Y drive when not logged on to the server. By contrast, tms6 has four data drives. The UNC path for each data drive indicates both the server name (e.g., tms6) and the share name (e.g., ateam). Logical drives that are made of storage arrays consist of multiple physical disk drives, which can be configured in different ways to allow redundancy (using RAID, which stands for Redundant Array of Inexpensive Disks or Redundant Array of Independent Disks). RAID 0 provides no redundancy, but it can often be the fastest configuration. For example, ateamarray and bteamarray have been set up with RAID 5, so they have redundancy in the case of a hard drive crash.

4 Mechanics of the model application process

The Version 2.3 family of travel models, including Ver. 2.3.75, is applied using a command-line interface (CLI), not a graphical user interface (GUI). The model is launched via a single command that is typed or pasted in a single command window (this is covered in the section about running the model). The Version 2.3 Travel Model makes use of the following:

- A series of pre-established batch files, which are used to call a series of Cube Voyager scripts (*.s) and Fortran programs (*.exe);
- A standardized subdirectory system, in which input files, output files, Cube Voyager scripts, and other files are organized; and
- The use of generically named input and output files, which are stored in designated locations in the subdirectory system.

An example subdirectory structure for applying the Version 2.3 model is shown in Figure 11. The "root" subdirectory appears at the top of the structure. The root subdirectory may exist anywhere on the computer hard drive and may be arbitrarily named by the analyst, but **it is recommended that the name of the root subdirectory include information about both the travel model being used (e.g. Ver2.3.75) and the modeling project being undertaken**. For example, an analyst performing model runs to support the Air Quality Conformity (AQC) analysis of the Constrained Element of Visualize 2045, the TPB's Long-Range Transportation Plan (CE LRTP) might name the root subdirectory as follows:

`C:\modelRuns\fy18\`**`Ver2.3.75_aqc_Vis2045`**

Note that the root subdirectory need not be located directly off the root of the C drive (or D drive, etc.). In the example above, the root subdirectory is below the "fy18" subdirectory. On the left side of Figure 11, there are five specially designated subdirectories under the root that are established:

- SOFTWARE: Fortran executable files and dynamic-link library (DLL) files
- CONTROLS: Control files that are required by the Fortran programs
- SCRIPTS: Cube Voyager scripts
- SUPPORT: General parameter files used by the scripts or other programs, such as AEMS (Fortran) and LineSum (C++)
- SUMMARY: Summary scripts, which are used to summarize the model run

The first four subdirectories are required, but the fifth subdirectory is optional. The SUPPORT subdirectory is reserved for parameter files that generally do not change by modeled scenario such as K-factors, F-factors, and the like. <u>The four required subdirectories must exist under the root, and must be named as shown</u>, although the names are not case sensitive. The optional summary subdirectory may be given any name. Furthermore, the files residing in these four required subdirectories should generally not be altered or renamed.

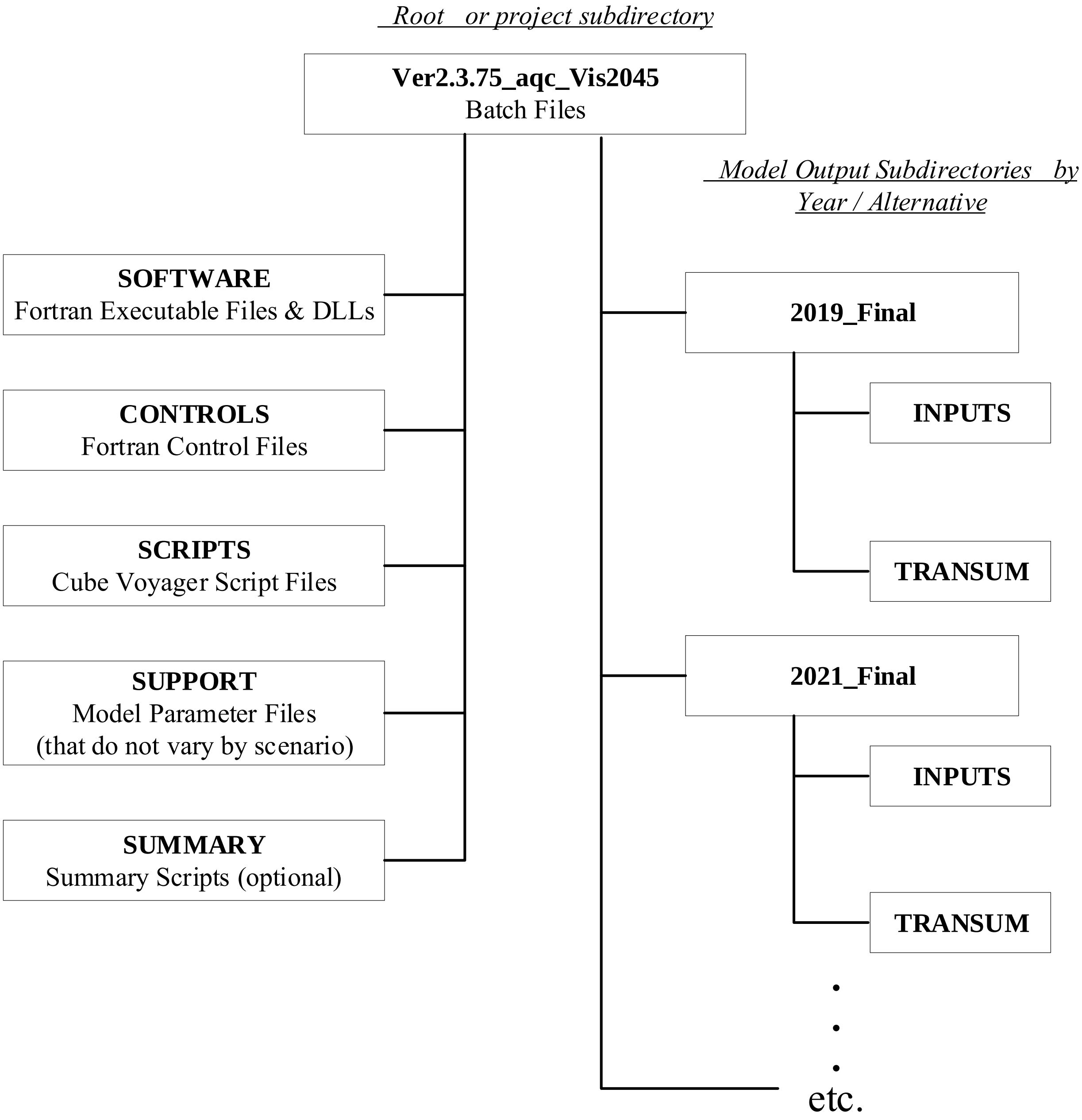

Figure 11 Subdirectory structure for executing the Version 2.3 Travel Model

Ref: "I:\ateam\docum\fy19\tpb_tdfm_gen2\ver2.3\travel_model_user_guide\directoryStruct_v2.3.75_model_v2.vsd"

The right side of Figure 11 shows two subdirectories, named "2019_Final" and "2021_Final."[49] These two subdirectories are the output subdirectories (a.k.a. the scenario subdirectories). The user is free to choose any name for output subdirectories. Since travel demand models are best used in a comparative

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[49] As of the Ver. 2.3.75 Model, we no longer require two runs of the travel model ("base" and "final") for each scenario modeled. However, some modelers continue to use the name "final" (e.g., 2021_final), even though there is only one run per scenario.

manner, a travel demand modeling project would typically have two or more scenarios or alternatives. Each alternative would get its own output subdirectory for scenario-specific outputs from the travel model.

Under each scenario-specific subdirectory that exists, there need to be two subdirectories, one named "inputs" and the other named "transum." These exact names must be used, but, as stated previously, names are case insensitive. The "transum" subdirectory is for storing summary information about the transit assignment summary. At the beginning of the model run, the "transum" subdirectory will be completely empty, but, at the end of the run, the subdirectory will contain reports from the process (LineSum) that summarizes the transit assignment. The "inputs" subdirectory is where one stores all necessary model inputs that area specific to a modeled scenario (see Table 9). Note that some "inputs" that are common to all modeled scenarios are stored in the "support" subdirectory (see Table 9, which also includes input files stored in the CONTROLS subdirectory). Input files in the "inputs" folder are named generically (e.g., land use data is stored in a file named zone.dbf; network link data is stored in a file named link.dbf, etc.). The user may establish an unlimited number of output subdirectories, as long as each one contains one "inputs" subdirectory and one "transum" subdirectory. Neither the inputs nor transum subdirectories can be shared among more than one alternative. After a model has been run, if the automated transit walkshed process was run with the model, then the "inputs" folder will contain a new subfolder called "Transit_Walksheds_GIS." In the default setup found with the model transmittal package, the automated transit walkshed process is not run (it is commented out). Note that the primary output file from the automated transit walkshed process (areawalk.txt) is now supplied in the inputs folder as part of the model transmittal package, so users need not re-run the process (it is commented out by default) unless users plan to make changes to the transit network, in which case it is recommended that the process be run.

The actual structure of the folders/subdirectories storing the travel model, its input files, and output folders, will be a function of the years/scenarios analyzed, but the list below is representative:

```
+---2019_final
|   +---Inputs
|   \---transum
+---2021_final
|   +---Inputs
|   \---transum
+---Controls
+---Docs
+---Scripts
+---Software
+---Summary
+---Support
```

If one is running multiple scenarios, **it is recommended that the analyst set up an electronic spreadsheet to keep track of metadata associated with each model run**. The metadata of importance will vary from study to study, but might contain items such as:

- Run number/ID (a unique sequence number to quickly name a model run)

- Parent run number/ID (indicates the run number of the run that formed the basis for the current run). Useful in figuring which run was derived from which other runs.
- Subdirectory name (i.e., the name of the root folder/subdirectory)
- Key modeling assumption parameters, such as the network year, land use year, land use round (e.g., Round 9.1), WMATA tariff number, etc.
- Key modeling output parameters, such as model run time, regional VMT, total transit, etc.

Table 9 Input files needed to run the Version 2.3 Travel Model, stored in the CONTROLS, INPUTS, and SUPPORT folders

No.	Folder	Filename	Description	File Type	Category	Modeling step where file is used	Transit/ Non-Transit Mode(s)
1	controls	HBO_NL_MC.ctl	HBO nested-logit mode choice mode control file	Text	Model	Mode choice (MC_Purp.bat & AEMS.EXE)	
2	controls	HBS_NL_MC.ctl	HBS nested-logit mode choice mode control file	Text	Model	Mode choice (MC_Purp.bat & AEMS.EXE)	
3	controls	HBW_NL_MC.ctl	HBW nested-logit mode choice mode control file	Text	Model	Mode choice (MC_Purp.bat & AEMS.EXE)	
4	controls	lineSum_MR_access.ctl	Summary of Metrorail riders by access mode	Text	Summary	LineSum.exe	
5	controls	lineSum_MR_line.ctl	Summary of Metrorail boardings, alightings, and ridership	Text	Summary	LineSum.exe	
6	controls	LineSum_Volume.ctl	Consolidate peak & off-peak vols from transit assignment	Text	Summary	LineSum.exe	
7	controls	NHO_NL_MC.ctl	NHO nested-logit mode choice mode control file	Text	Model	Mode choice (MC_Purp.bat & AEMS.EXE)	
8	controls	NHW_NL_MC.ctl	NHW nested-logit mode choice mode control file	Text	Model	Mode choice (MC_Purp.bat & AEMS.EXE)	
9	controls	station_names.dbf	Contains rail station names (derived from station.dbf)	DBF	Metadata	Created by set_factors.s; Used by LineSum	
1	inputs	airpax.adr	Air Passenger Auto Driver Trips	Binary	Assumptions	Miscellaneous time of day	
2	inputs	AM_Tfac.dbf	AM Toll Factors by Vehicle Type	DBF	Assumptions	Highway skimming and assignment	
3	inputs	areadef3722.prn	Input TAZ-Mode choice district equivalence	Text	Assumptions	Transit fare development (prefarv23.s)	
4	inputs	AreaWalk.txt	Optional. This file is now generated/re-generated by model	Text	Transit network	Generated by automated ArcPy process	
5	inputs	AT_override.TXT	Cases where zones have area-type override values	Text	Assumptions	AreaType_File.s	
6	inputs	Bus_Factor_File.dbf	Local Bus Time Degradation Factors	DBF	Assumptions	transit_skims_??.s	
7	inputs	bus_pnrn.tb	Bus PNR lots	Text	Transit network	transit_skims_??.s	1,2,6-9
8	inputs	BUSFARAM.ASC	AM Bus Fare matrix (Bus fares zones '1' to '21')	Text	Assumptions	mfare2.s	
9	inputs	BUSFAROP.ASC	OP Bus Fare matrix (Bus fares zones '1' to '21')	Text	Assumptions	mfare2.s	
10	inputs	com_bus.tb	Transfer link (walk) between commuter rail station and bus & LRT stop	Text	Transit network	transit_skims_??.s	12
11	inputs	com_link.tb	Commuter rail links	Text	Transit network	transit_skims_??.s	4
12	inputs	com_node.tb	Commuter rail stations	Text	Transit network	transit_skims_??.s	4
13	inputs	com_pnrn.tb	Commuter rail PNR lots	Text	Transit network	transit_skims_??.s	4
14	inputs	CPI_File.txt	Assumed rate of inflation, based on historical CPI	Text	Assumptions	Set_CPI.s	
15	inputs	Ext_PsAs.dbf	External Productions and Attractions	DBF	Observed data	trip_generation.s	
16	inputs	GIS_Variables.dbf	GIS variables used to calculate non-motorized trips	DBF	Observed data	trip_generation.s	
17	inputs	HBO_NL_MC.MTT	Pre-existing mode choice model output	Binary	Assumptions	pp_auto_drivers.s	
18	inputs	HBS_NL_MC.MTT	Pre-existing mode choice model output	Binary	Assumptions	pp_auto_drivers.s	
19	inputs	HBW_NL_MC.MTT	Pre-existing mode choice model output	Binary	Assumptions	pp_auto_drivers.s	
20	inputs	Jur.dbf	Equiv. between juris and river superdistricts: Disallows river crossings for PNR	DBF	Land use	Autoacc5.s	
21	inputs	Link.dbf	Highway network links	DBF	Highway network	V2.3_Highway_Build.s	
22	inputs	lrt_bus.tb	Transfer link (walk) between LRT station and bus stop	Text	Transit network	transit_skims_??.s	12
23	inputs	lrt_link.tb	LRT links	Text	Transit network	transit_skims_??.s	5
24	inputs	lrt_node.tb	LRT stations/stops	Text	Transit network	transit_skims_??.s	5
25	inputs	lrt_pnrn.tb	LRT PNR lots	Text	Transit network	transit_skims_??.s	5
26	inputs	MD_Tfac.dbf	MD Toll Factors by Vehicle Type	DBF	Assumptions	Highway skimming and assignment	
27	inputs	met_bus.tb	Transfer link (walk) between Metrorail station and bus stop	Text	Transit network	transit_skims_??.s	12
28	inputs	met_link.tb	Metrorail links	Text	Transit network	transit_skims_??.s	3
29	inputs	met_node.tb	Metrorail stations	Text	Transit network	transit_skims_??.s	3
30	inputs	met_pnrn.tb	Metrorail PNR lots	Text	Transit network	transit_skims_??.s	3
31	inputs	metlnkm1.tb	Metrorail Links	Text	Transit network	metrorail_skims.s	
32	inputs	metnodm1.tb	Metrorail Nodes	Text	Transit network	metrorail_skims.s	
33	inputs	mfare1.a1	Metrorail Sta XYs scaled to 1/100ths of miles	Text	Transit network	mfare1.s	
34	inputs	mfare1_Sta_Disc.ASC	Metrorail Sta fare discount array in cents	Text	Assumptions	mfare1.s	
35	inputs	MODE1AM,… MODE10AM.tb	AM Transit Line Files	Text	Transit network	transit_skims_??.s	
36	inputs	MODE1OP,… MODE10OP.tb	OP Transit Line Files	Text	Transit network	transit_skims_??.s	
37	inputs	new_bus.tb	Transfer link (walk) between BRT/streetcar stop and bus stop	Text	Transit network	transit_skims_??.s	12
38	inputs	new_link.tb	BRT/streetcar links	Text	Transit network	transit_skims_??.s	10
39	inputs	new_node.tb	BRT/streetcar stations/stops	Text	Transit network	transit_skims_??.s	10
40	inputs	new_pnrn.tb	BRT/streetcar PNR lots	Text	Transit network	transit_skims_??.s	10
41	inputs	NHO_NL_MC.MTT	Pre-existing mode choice model output	Binary	Assumptions	pp_auto_drivers.s	
42	inputs	NHW_NL_MC.MTT	Pre-existing mode choice model output	Binary	Assumptions	pp_auto_drivers.s	
43	inputs	Node.dbf	XY coordinates of nodes in highway network	DBF	Highway network	AreaType_File.s	
44	inputs	NT_Tfac.dbf	NT Toll Factors by Vehicle Type	DBF	Assumptions	Highway skimming and assignment	
45	inputs	Pen.dbf	List of TAZs considered to be in the "slugging" shed of the Pentagon	DBF	Assumptions	Autoacc5.s	
46	inputs	PM_Tfac.dbf	PM Toll Factors by Vehicle Type	DBF	Assumptions	highway_assignment.s	
47	inputs	schl.adr	School Auto Driver Trips	Binary	Assumptions	misc_time-of-day.s	

No.	Folder	Filename	Description	File Type	Category	Modeling step where file is used	Transit/ Non-Transit Mode(s)
48	inputs	`StaAcc.dbf`	Lookup table: Maximum drive-access-to-transit distances	DBF	Assumptions	Autoacc5.s	
49	inputs	`station.dbf`	Station file: Metrorail, commuter rail, LRT stations/PNR lots and bus PNR lots	DBF	Transit network	parker.s	
50	inputs	`tariff.txt`	WMATA tariff policy	Text	Assumptions	mfare1.s	
51	inputs	`taxi.adr`	Taxi Auto Driver Trips	Binary	Assumptions	misc_time-of-day.s	
52	inputs	`tazfrzn.asc`	Fare Zone File	Text	Assumptions	prefarv23.s	
53	inputs	`Toll_Esc.dbf`	Toll escalation assumptions: Highway tolls & deflators	DBF	Assumptions	V2.3_Highway_Build.s	
54	inputs	`trnpen.dat`	Turn Penalty file to ensure correct Metrorail fares	Text	Assumptions	metrorail_skims.s	
55	inputs	`visi.adr`	Visitor Auto Driver Trips	Binary	Assumptions	misc_time-of-day.s	
56	inputs	`xtrawalk.dbf`	Extra walk links that the analyst wishes to include	DBF	Transit network	walkacc.s	13
57	inputs	`xxaut.vtt`	Auto Driver Through Trips	Binary	Assumptions	misc_time-of-day.s	
58	inputs	`XXCVT.vtt`	Com/Mtk/Htk through Trips	Binary	Calculated data	misc_time-of-day.s	
59	inputs	`Zone.dbf`	Land use/land activity data at zonal level, 3722 TAZ	DBF	Land use	AreaType_File.s	
1	support	`AM_SPD_LKP.txt`	Initial lookup speeds used for highway links, AM period	Text	Highway network	V2.3_Highway_Build.s	
2	support	`AttrRates.dbf`	Trip Attractions	DBF	Calculated data	trip_generation.s	
3	support	`cvdelta_3722.trp`	Calibration matrix, or "delta table" for commercial vehicles	Binary	Assumptions	misc_time-of-day.s	
4	support	`equiv_toll_min_by_inc.s`	Equivalent minutes (min/'07$) by period & income level	Text	Assumptions	trip_distribution.s	
5	support	`HBincRat.dbf`	HB Income Shares	DBF	Calculated data	trip_generation.s	
6	support	`hwy_assign_capSpeedLookup.s`	FT x AT Speed & Capacity lookup	Text	Highway network	highway_assignment.s	
7	support	`hwy_assign_Conical_VDF.s`	Volume Delay Functions file	Text	Highway network	highway_assignment.s	
8	support	`MD_SPD_LKP.txt`	Initial lookup speeds used for highway links, midday	Text	Highway network	V2.3_Highway_Build.s	
9	support	`NMArates.dbf`	Non-motorized Trip Attractions	DBF	Calculated data	trip_generation.s	
10	support	`NMPrates.dbf`	Non-motorized Trip Productions	DBF	Calculated data	trip_generation.s	
11	support	`TAZ3722_to_7Mrkts.txt`	Equivalency between TAZs and mode choice superdistricts	Text	Assumptions	PP_Auto_Drivers.s	
12	support	`tkdelta_3722.trp`	Calibration matrix, or "delta table" for med and hvy truck	Binary	Assumptions	misc_time-of-day.s	
13	support	`todcomp_2008HTS.dbf`	Time of day model/factors	Binary	Assumptions	time-of-day.s	
14	support	`toll_minutes.txt`	Toll minutes equivalence file by Vehicle Type	Text	Assumptions	Highway_skims.s	
15	support	`TPBMod_Jur_Boundary.shp`	Jurisdictional boundaries	SHP	Network	Network editing with Cube Base	
16	support	`Truck_Com_Trip_Rates.dbf`	Truck and Commercial Vehicle Trip Rates	DBF	Calculated data	truck_com_trip_generation.s	
17	support	`True_Shape_2040_Nov20.shp`	Used to display highway network with True Shape	SHP	Highway network	Network editing with Cube Base	
18	support	`Ver23_f_factors.dbf`	F-factors for trip distribution	DBF	Calculated data	trip_distribution.s	
19	support	`weighted_trip_rates.dbf`	Trip Productions	DBF	Calculated data	trip_generation.s	

* This file is created automatically by set_factors.s from the station.dbf file.

Ref: v2.3.75_inputs_v1.xlsx

Pre-established "parent" and "child" batch files for executing the model reside in the root subdirectory. Typically, "parent" batch files are edited to correspond to each modeled scenario, while "child" batch files remain unaltered. The parent batch files can be named as the user likes. The two main parent batch files are the "wrapper" batch file and the "run model steps" batch file (the latter file used to be called the "run all" batch file). Details about these two files can be found in section 6.2 ("Parent batch files") on page 57. The child batch files are the ones that actually execute individual modeling steps, such as the trip generation step (e.g., Trip_Generation.bat) or the traffic assignment step (e.g., Highway_Assignment_Parallel.bat). Child batch files generally call the Cube Voyager scripts and/or Fortran programs. The child batch files also assign names to report files that result from each model step. Listing files are typically assigned file extensions of RPT or TAB. The former refers to Cube Voyager report or listing files, while the latter refers to a subset tabulation of the report file containing only trip table totals or jurisdictional summaries. Parent batch files are used to string child batch files together so that the entire model execution can be initiated with a single command or batch file. The parent batch files also establish Windows environment variables that are used in the child batch files and Cube Voyager scripts, such as the iteration number, the model year, and the model description.

As stated earlier, all the input files located in the "inputs," "controls," and "support" folders are listed in Table 9. It is the user's responsibility to make sure that the generically named files are appropriate for the modeled scenario and are in the prescribed format (described later). Additionally, almost all the files shown in Table 9 must exist for the model run to complete successfully, with the exception of some files such as the shapefiles used for displaying a highway network in True Shape mode (True_Shape_2040_Nov20.shp). The advantage of using generic filenames is that the input and output filenames referenced in each Cube Voyager script and control file do not need to be tailored to match the different scenarios that are run. The disadvantage of using generic filenames is that, when moving or sharing files, two files with the same name could be quite different (e.g., zone.dbf for the year 2019 has the same name as zone.dbf for the year 2045). Thus, the metadata that describes the scenario name is stored in the name of the output subdirectory (e.g., "2019_Final"), not in the filenames themselves.

The SOFTWARE folder contains two Fortran executable programs (AEMS.exe and extrtab.exe), one C++ executable program (LineSum.exe),[50] and several dynamic-link library (DLL) files, as shown in Table 10.

---

[50] In the future, if we replace AEMS with TRANSIMS ModeChoice, this folder will also include the C++ mode choice application program ModeChoice.exe.

Table 10 Fortran and C++ executable files and dynamic-link library files required for running the Version 2.3 travel model

Executable Name	Ver	Date	Size (bytes)	Program Function	Requires a control file?
AEMS.exe		2/13/2012	195,900	Mode choice application program (Fortran, 32-bit)	yes
cw3240.dll		2/13/2012	827,392	Dynamic-link library file associated w/ AEMS.exe	no
DFORMD.dll		2/13/2012	425,984	Dynamic-link library file associated w/ AEMS.exe	no
extrtab.exe		2/13/2012	464,559	Extracts sections from Cube Voyager report files (Fortran, 32-bit)	no
Linesum.exe	6.0.2	3/26/2014	697,344	Creates reports summarizing transit loaded link files (C++, 32-bit)	yes

Note: There are two Cube DLL files needed for running AEMS.exe: Tppdlibx.dll and Tputlibc.dll.[51] These two files come with Cube. **These are not stored in the software folder**, but when AEMS runs, it needs to "see" these two files. This can be accomplished by either 1) placing a copy of these two files in the folder where AEMS runs (the SOFTWARE folder under the root folder of the model run); OR 2) **setting the Windows PATH environment variable to point to the location where these DLL files exist**. **It has been found that the second option is generally the best one**. One complicating factor is the fact that Cube Base is 32-bit and Cube Voyager is 64-bit, and each comes with a version of these two files (see Table 11). **AEMS needs the 32-bit version** (which is stored here: C:\Program Files (x86)\Citilabs\CubeVoyager). For more information about setting the Windows PATH environment variable, see section 5.1 ("Software installation").

Table 11 Location for Cube DLL files

Cube DLL File	Location for 32-bit version	Location for 64-bit version
TPPDLIBX.DLL	C:\Program Files (x86)\Citilabs\Cube\	none
	C:\Program Files (x86)\Citilabs\CubeVoyager\	C:\Program Files\Citilabs\CubeVoyager\
TPUTLIBC.DLL	C:\Program Files (x86)\Citilabs\Cube\	none
	C:\Program Files (x86)\Citilabs\CubeVoyager\	C:\Program Files\Citilabs\CubeVoyager\

A listing of child batch files is provided in Table 12. The table also indicates the programs and/or Cube Voyager scripts that are invoked and the purpose of each batch file. Given the iterative application process of the model, most of the batch files are called multiple times during a model run. The sequence of batch file applications, by iteration, is shown in Table 13. The table indicates that there are 48 batch file steps called during a standard application of the model. Some of the batch files are called once, while others (e.g., *Trip_Generation.bat*) are called during the pump-prime and all four standard iterations. A parent batch file ("*run_ModelSteps*.bat*") is used to string each of the child batch files together during a typical model execution. The parent batch files, like child batch files, reside in the root subdirectory. Two parent batch files are typically prepared for each individual model run. The process for executing a model is addressed in the next section. The remaining chapters address the specific details of each modeling step.

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[51] In earlier versions of Cube, the filename of the second file omitted the letter "c": Tputlib.dll

Table 12 Child batch files used to run the Version 2.3 Travel Model

Batch File	Scripts/Programs	Purpose
set_up_model_run_folders.bat	None	Not used in the running of the mode, but can be used to set up folders for a new model run.
ArcPy_Walkshed_Process.bat	MWCOG_Prepare_Inputs_to_Walkshed_Process_PT.s MWCOG_Prepare_Inputs_to_Walkshed_Process_TRNBUILD.s	Run the automated/integrated ArcPy/Python transit walkshed process
Set_CPI.bat	Set_CPI.s Set_Factors.s	Create highway and transit cost deflators. Create K factors and time penalties. Create station_names.dbf file from station.dbf file.
PP_Highway_Build.bat	AreaType_File.s V2.3_higway_build.s	Build highway networks.
PP_Highway_Skims.bat (see also Highway_Skims.bat)	Highway_skims_am.s Highway_skims_md.s Modnet.s CheckStationAccess.s Highway_skims_mod_am.s Highway_skims_mod_md.s Joinskims.s Remove_PP_Speed.s	Create AM/off-peak highway skims. Check whether stations are accessible
Transit_Skim_All_Modes_Parallel.bat	parker.s walkacc.s autoacc5.s transit_Accessibility.s Transit_Skim_LineHaul_Parallel.bat Transit_Skims_AB.s Transit_Skims_BM.s Transit_Skims_CR.s Transit_Skims_MR.s	Create the transit network: • Create transit access links • Create transit network • Skim the four transit submodes Also runs the transit accessibility process.
Transit_Fare.bat	prefarV23.s Metrorail_skims.s MFARE1.s MFARE2.s Assemble_Skims_MR.s Assemble_Skims_BM.s Assemble_Skims_AB.s Assemble_Skims_CR.s	Create transit fares for the current speed feedback iteration.
Trip_Generation.bat	Demo_Models.s Trip_Generation.s Trip_Generation_Summary.s Truck_Com_Trip_Generation.s	Execute daily trip generation.
Trip_Distribution.bat	Prepare_Ext_Auto_Ends.s Prepare_Ext_ComTruck_Ends.s Trip_Distribution_External.s Prepare_Internal_Ends.s Trip_Distribution_Internal.s	Execute daily trip distribution.
Mode_Choice_Parallel.bat	MC_purp.bat => AEMS.EXE mc_NL_summary.s	Execute the daily mode choice model (in P/A format).

Batch File	Scripts/Programs	Purpose
copyBaseMC_to_final_inputs.bat	None	Not currently called as part of a model run. Could potentially be used by modeler to copy pre-existing NL mode choice model output into the input folder for new run.
Auto_Driver.bat	mc_Auto_Drivers.s	Generate initial auto driver trips after mode choice.
PP_Auto_Drivers.bat	PP_Auto_Drivers.s	Generate initial auto driver trips without the use of the mode choice model.
Time-of-Day.bat	Time-of-Day.s Misc_Time-of-Day.s Prepare_Trip_Tables_for_Assignment.s	Convert daily modeled trips to AM, PM, midday, and night. Convert trip tables from P/A format to O/D format.
Highway_Assignment_Parallel.bat	Highway_Assignment_Parallel.s	Execute user equilibrium highway assignment for four time-of-day periods
Average_Link_Speeds.bat	Average_Link_Speeds.s	Compute average link speeds. Run for only speed feedback iterations 2-4
Highway_Skims.bat	Highway_Skims_am.s Highway_Skims_md.s modnet.s Highway_Skims_mod_am.s Highway_Skims_mod_md.s joinskims.s	Build zone-to-zone paths on the highway network and skim the times and costs on each path. Store the skimmed times and paths in matrix files.
Transit_Assignment_Parallel.bat	Combine_Tables_For_TrAssign_Parallel.s Transit_Assignment_LineHaul_Parallel.bat Transit_Assignment_AB.s Transit_Assignment_BM.s Transit_Assignment_CR.s Transit_Assignment_MR.s	Execute the transit assignment (P/A format) for peak and off-peak periods
TranSum.bat	LineSum_*.ctl (such as LineSum_Volume.ctl, or lineSum_MR_access.ctl)	Summarize the transit assignment
dateName.bat	None (used by searchForErrs.bat)	
searchForErrs.bat	None	Searches through log and print files for possible error codes
move_temp_files_v6.bat	None	Moves temporary files to a location where they can be later deleted manual by the modeler.
updating_tpp_dll_files.bat	None	Not used for a model run. In the past, this batch file could be used to put the TP+ DLL files in the correct location, but this file is no longer used.

Table 13 Sequence of the batch files used to run the Version 2.3 Travel Model

		Speed Feedback Iteration				
Batch File	**Scripts/Programs**	**PP**	**1**	**2**	**3**	**4**
ArcPy_Walkshed_Process.bat	MWCOG_Prepare_Inputs_to_Walkshed_Process_PT.s MWCOG_Prepare_Inputs_to_Walkshed_Process_TRNBUILD.s	1				
Set_CPI.bat	Set_CPI.s Set_Factors.s	2				
PP_Highway_Build.bat	AreaType_File.s V2.3_higway_build.s	3				
PP_Highway_Skims.bat (see also Highway_Skims.bat)	Highway_skims_am.s Highway_skims_md.s Modnet.s CheckStationAccess.s Highway_skims_mod_am.s Highway_skims_mod_md.s Joinskims.s Remove_PP_Speed.s	3				
Transit_Skim_All_Modes_Parallel.bat	parker.s walkacc.s autoacc5.s transit_Accessibility.s Transit_Skim_LineHaul_Parallel.bat Transit_Skims_AB.s Transit_Skims_BM.s Transit_Skims_CR.s Transit_Skims_MR.s	5	12	21	30	39
Transit_Fare.bat	prefarV23.s Metrorail_skims.s MFARE1.s MFARE2.s Assemble_Skims_MR.s Assemble_Skims_BM.s Assemble_Skims_AB.s Assemble_Skims_CR.s		13	22	31	39
Trip_Generation.bat	Demo_Models.s Trip_Generation.s Trip_Generation_Summary.s Truck_Com_Trip_Generation.s	6	14	23	32	41
Trip_Distribution.bat	Prepare_Ext_Auto_Ends.s Prepare_Ext_ComTruck_Ends.s Trip_Distribution_External.s Prepare_Internal_Ends.s Trip_Distribution_Internal.s	7	15	24	33	42
Mode_Choice_Parallel.bat	MC_purp.bat => AEMS.EXE mc_NL_summary.s		16	25	34	43
Auto_Driver.bat	mc_Auto_Drivers.s		17	26	35	44
PP_Auto_Drivers.bat	PP_Auto_Drivers.s	8				
Time-of-Day.bat	Time-of-Day.s Misc_Time-of-Day.s Prepare_Trip_Tables_for_Assignment.s	9	18	27	36	45
Highway_Assignment_Parallel.bat	Highway_Assignment_Parallel.s	10	19	28	37	46

		Speed Feedback Iteration				
Batch File	**Scripts/Programs**	**PP**	**1**	**2**	**3**	**4**
Highway_Skims.bat	Highway_Skims_am.s Highway_Skims_md.s modnet.s Highway_Skims_mod_am.s Highway_Skims_mod_md.s joinskims.s	11	20	29	38	47
Transit_Assignment_Parallel.bat	Combine_Tables_For_TrAssign_Parallel.s Transit_Assignment_LineHaul_Parallel.bat Transit_Assignment_AB.s Transit_Assignment_BM.s Transit_Assignment_CR.s Transit_Assignment_MR.s					48
TranSum.bat	LineSum_*.ctl (such as LineSum_Volume.ctl, or lineSum_MR_access.ctl)					49

5 Preparing to run the model

Before the travel model can be run, one must install the necessary software, as described in the next section.

5.1 Software installation and setting the Windows PATH environment variable

Step 1: Make sure you are logged on to your computer with administrator privileges, so you can install software (or ask your IT department to perform the installation).

At COG, you will need to be a member of these two groups: "Administrators" and "SophosAdministrator" (the second group is associated with antivirus software). In other agencies, there may be other requirements. Additionally, based on testing done at COG, the mode choice application program (AEMS.EXE) may not work if you are not part of the Administrators group.

Step 2: Verify that your computer is running a 64-bit version of Windows, since this is needed to install the 64-bit version of Cube Voyager (Cube Base is still 32-bit software).

<Windows key><Pause/Break> will bring up the System Properties window. The "System Type" should be listed as "64-bit Operating System." Alternatively, if you prefer using the command prompt, you can run the command "systeminfo | more":

- If you are running a 32-bit version of Windows, you will see "System Type: X86-based PC". This will not allow you to install the 64-bit version of Cube Voyager, so you will not be able to run the Ver. 2.3.75 model.
- If you are running a 64-bit version of Windows, you will see "System Type: x64-based PC".

On 64-bit versions of Windows

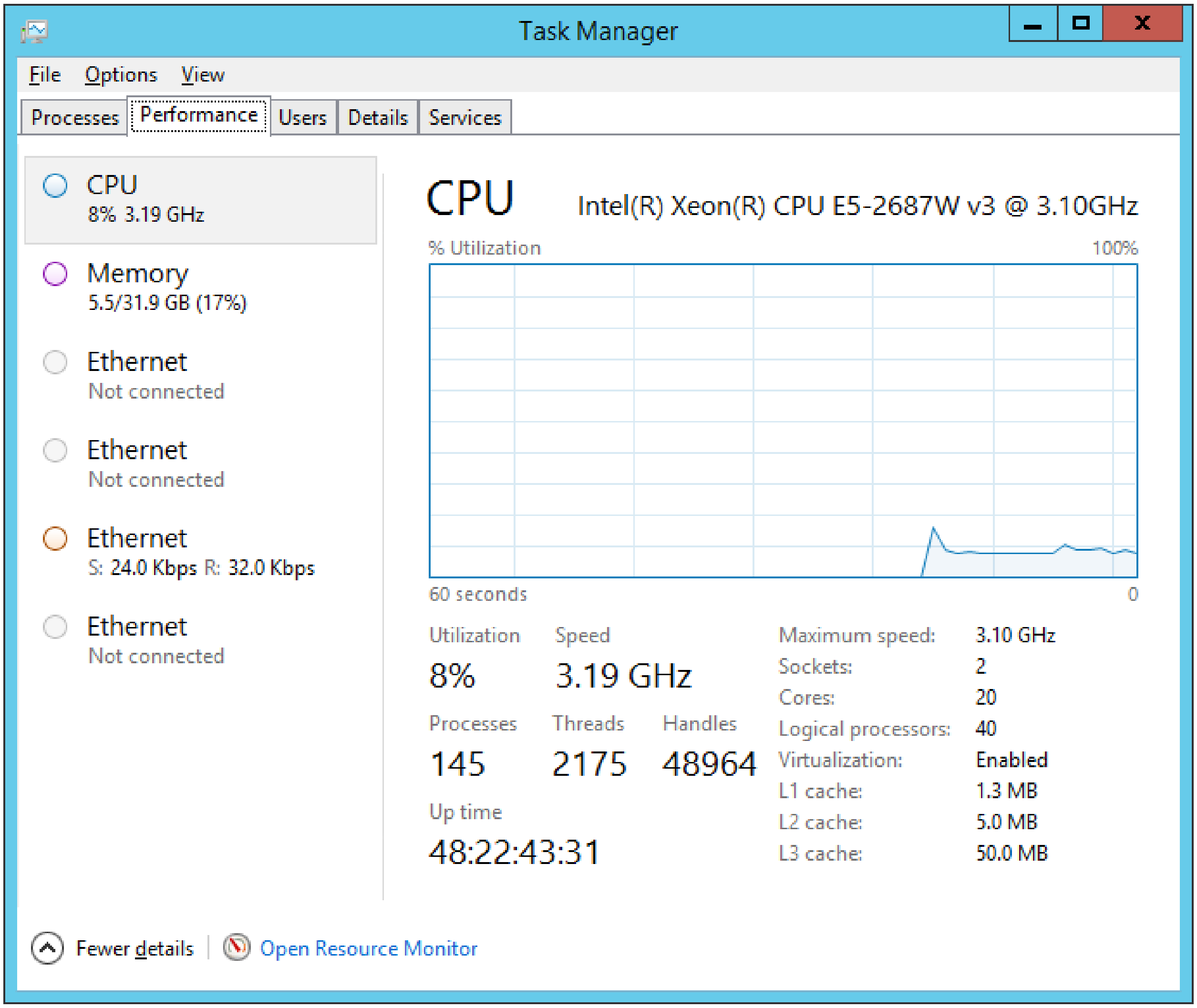
- 64-bit software, such as Cube Voyager, is stored here: "C:\Program Files".

- 32-bit software, such as Cube Base, is stored here: "C:\Program Files (x86)".

Step 3: Determine the number of cores on your computer.

Again, <Windows key><Pause/Break> will bring up the System Properties window. Here you can see the CPU type (e.g., "Intel Core i5-4590"). You can perform an internet search with this information to find the number of cores that are contained in your processor.

Also, if you open up the Task Manager (keyboard combination <CTRL><SHIFT><ESC>) and select the Performance tab, you can see the number of cores that the Windows operating system sees, as well as the number of logical processors (see Figure 12).



CPU Intel(R) Xeon(R) CPU E5-2687W v3 @ 3.10GHz

Utilization 8%
Speed 3.19 GHz
Processes 145
Threads 2175
Handles 48964
Up time 48:22:43:31

Maximum speed: 3.10 GHz
Sockets: 2
Cores: 20
Logical processors: 40
Virtualization: Enabled
L1 cache: 1.3 MB
L2 cache: 5.0 MB
L3 cache: 50.0 MB

Figure 12 Number of cores and logical processors

In this example, Windows sees 20 cores and 40 logical processors. If the number of logical processors is double the number of cores, this means that Intel's Hyper-Threading Technology is turned on. Intel's

Hyper-Threading Technology allows each core to handle two threads, so the operating system (OS) will see twice as logical processors as the actual number of physical cores.

Step 4: Install Citilabs Cube Base and Cube Voyager software, according to the vendor’s instructions. If you have purchased the license for Cube Cluster, this will also be installed at this point.

Once you have installed Cube Base, you can open it and click on help (“ ? ”) and “About…”, which should bring up a window like the following:

```
Current Version
Version        6.4.1 (Oct 01 2015)
               with Report Option
BDE version    5.0.0 (Nov 04 1999)
AM version     6.4.1 (Oct 01 2015)
               @ C:\Program Files (x86)\Citilabs\Cube
SM version     6.4.1 (Oct 01 2015)
               @ C:\Program Files (x86)\Citilabs\Cube
GIS version    10.3.4959

Environment
Platform               Microsoft Windows Server 2012 ...
OS version             6.3.9600
Memory in use          39%
Total physical memory  31.87 GB
Free physical memory   19.21 GB
Processors             10

License
Activation key
Licensed to
Maintenance thru   2/2019

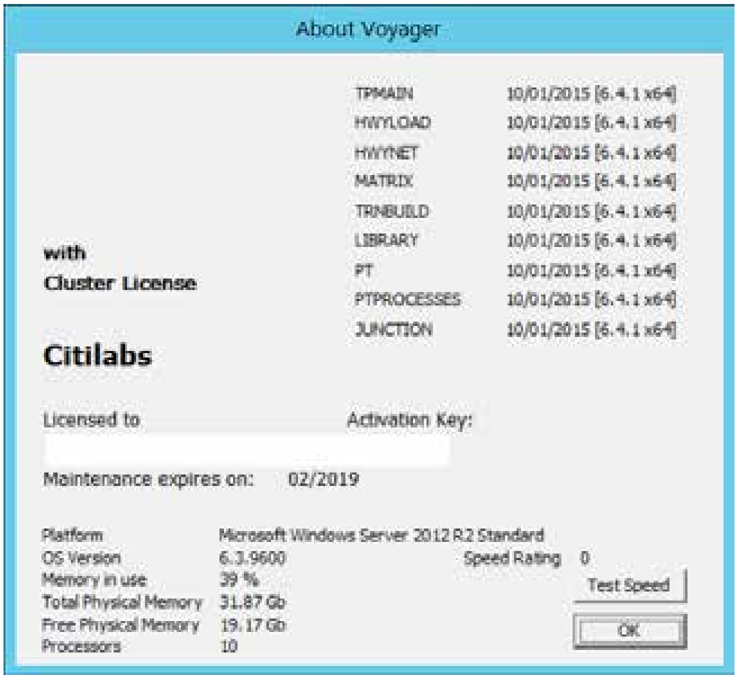
This product includes color specifications and designs developed by Cynthia Brewer (http://colorbrewer.org/)
```

Figure 13 Citilabs Cube 6.4, “About” message window

From this window, we can see that we have installed Cube Base, version 6.4.1. The maintenance license expires in Feb. 2019. Cube sees 10 processors, even though this is on a computer with 20 cores and 40 logical processors.

If you are running the Ver. 2.3 Travel Model on a computer with fewer than 8 logical processors, you will need to follow the instructions in Table 19 (p. 84) before running the Ver. 2.3 Travel Model.

Determining if you have Cube Cluster: If you wish to determine whether a given computer includes a Cube Cluster license, open Cube Voyager and click the “About Voyager” button. If your computer has a Cube Cluster license, you should see “with Cluster License” (as shown in Figure 14).



TPMAIN	10/01/2015 [6.4.1 x64]
HWYLOAD	10/01/2015 [6.4.1 x64]
HWYNET	10/01/2015 [6.4.1 x64]
MATRIX	10/01/2015 [6.4.1 x64]
TRNBUILD	10/01/2015 [6.4.1 x64]
LIBRARY	10/01/2015 [6.4.1 x64]
PT	10/01/2015 [6.4.1 x64]
PTPROCESSES	10/01/2015 [6.4.1 x64]
JUNCTION	10/01/2015 [6.4.1 x64]

with
Cluster License

Citilabs

Licensed to

Activation Key:

Maintenance expires on: 02/2019

Platform	Microsoft Windows Server 2012 R2 Standard
OS Version	6.3.9600
Memory in use	39 %
Total Physical Memory	31.87 Gb
Free Physical Memory	19.17 Gb
Processors	10

Speed Rating 0

Figure 14 "About Voyager": Presence of Cube Cluster license

According to Citilabs, the "Test Speed" button is no longer active. This window also shows 10 processors, even though this computer has 20 cores and 40 logical processors.

Step 5: Make sure that the version of PowerShell is 3.0 or higher. One may check their PowerShell version by using $PSVersionTable command in Windows PowerShell.

```
Windows PowerShell
Copyright (C) 2014 Microsoft Corporation. All rights reserved.

PS U:\> $psversiontable

Name                           Value
----                           -----
PSVersion                      4.0
WSManStackVersion              3.0
SerializationVersion           1.1.0.1
CLRVersion                     4.0.30319.42000
BuildVersion                   6.3.9600.18968
PSCompatibleVersions           {1.0, 2.0, 3.0, 4.0}
PSRemotingProtocolVersion      2.2


PS U:\> _
```

Figure 15 Windows PowerShell version

Most computers will likely be running Windows PowerShell 3.0 (or more recent), which comes preinstalled with Windows operating systems. If the version of PowerShell is 1.0 or 2.0, which may come with older versions of Windows, such as Windows XP or Windows Server 2008 SP1, the framework needs an upgrade to a more recent version. The steps to install a more recent Windows PowerShell version can be found in the Microsoft webpage "https://docs.microsoft.com/en-us/powershell/scripting/setup/installing-windows-powershell?view=powershell-6".

Step 6: If you do not already have one, install the text editor of your choice, such as Notepad++ or PSPad. Notepad++ is free and open source. PSPad is free but is not open source. Each of these text editors has it pluses and minuses, in terms of syntax highlighting, code folding, and other features, such as diffing two text files. Some non-open source text editors may include bloat-ware, which you may not want, so, when performing the installation, you need to be vigilant and de-select any options you do not want.

Step 7: (Optional) Install Cygwin (http://www.cygwin.com/). **Like Ver. 2.3.70, the Ver. 2.3.75 model does not need this software**. Nonetheless, some users may still choose to install this software, due to its ability to offer various Unix-like utility commands. This is a free, open source software package that provides a Linux-like environment for Windows. It provides a series of Unix-like command-line tools, such as head, tail, and which. Cygwin comes in two versions: a 32-bit version (setup-x86.exe) and a 64-bit version (setup-x86_64.exe). Normally, we would advise you to install the version that is appropriate for your computer. However, in the past, we have found that, in the 64-bit version of Cygwin, the head and tail commands did not seem to work correctly. **Consequently, if you choose to install Cygwin, we recommend that you install the 32-bit version of the software**.

1. Download the 32-bit version of Cygwin: setup-x86.exe.
2. Double click the setup file to run. It will install a default set of packages. You can always add more in the future by rerunning the setup file.

Do not forget where this file is, since you might need to run it in the future to add or remove components from Cygwin. The recommended location is to place the file is in a folder in your "downloads" folder (e.g., C:\Users\<username>\downloads\cygwin). Once you have done this, you should create a shortcut to the setup file on the Windows Desktop so that you can find this file easily in the future. As an alternative, you can also store the setup file directly on the Windows Desktop. The disadvantage with this second location is that, during the installation procedure, Cygwin will place a folder of downloaded files on the Desktop, and this folder may have an odd name, such as "ftp%3a%2f%2fftp.gtlib.gatech.edu%2fpub%2fcygwin%2f".

Step 8: Set the Windows PATH environment variable.

Among other files, the 32-bit software folder (C:\Program Files (x86)\Citilabs\CubeVoyager) contains the following files:

```
10/01/2015  07:11 AM         3,416,528 CLUSTER.EXE
10/01/2015  07:44 AM           111,056 RUNTPP.EXE
10/01/2015  07:44 AM           415,744 TPPDLIBX.DLL
10/01/2015  07:44 AM           152,576 TPUTLIBC.DLL
```

By contrast, the 64-bit software folder (C:\Program Files\Citilabs\CubeVoyager) contains the following files:

```
10/01/2015  07:11 AM         4,206,544 CLUSTER.EXE
10/01/2015  07:45 AM           150,480 RUNTPP.EXE
10/01/2015  07:45 AM           373,712 VOYAGER.EXE
```

```
10/01/2015  07:44 AM           511,488 TPPDLIBX.DLL
10/01/2015  07:44 AM           178,688 TPUTLIBC.DLL
```

AEMS.EXE requires the use of the two TP DLL files in the 32-bit folder (C:\Program Files (x86)\Citilabs\CubeVoyager), so the Windows PATH variable should point to that folder. However, the 32-bit folder contains the wrong version of Cluster and does not contain Voyager.exe at all. Luckily, when Voyager.exe is called using the "start /w" command, Windows knows how to find the correct version of Voyager (in this case, the only version of Voyager). Thus, as a minimum, you will want to add the following two paths to your Windows PATH environment variable:

64-bit version of Windows	**Reason**
C:\cygwin\bin	Needed to run Cygwin from the command line
C:\Program Files (x86)\Citilabs\CubeVoyager	Needed so that AEMS can find the two TP DLL files (Tppdlibx.dll and Tputlibc.dll)

Additionally, the following paths might also be useful additions to your Windows PATH environment variable:

64-bit version of Windows	**Reason**
C:\Program Files (x86)\PSPad editor	To be able to open the PSPad text editor from the command line
C:\Program Files (x86)\WinMerge	To be able to open WinMerge from the command line

Here are instructions for updating the Windows PATH environment variable:

Hold down these two keys simultaneously to bring up the Windows System Properties window:

<Windows key><Pause/Break key>

View basic information about your computer

Windows edition

Windows Server 2012 R2 Standard

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System

Processor: Intel(R) Xeon(R) CPU E5-2687W v3 @ 3.10GHz 3.10 GHz (2 processors)
Installed memory (RAM): 32.0 GB (31.9 GB usable)
System type: 64-bit Operating System, x64-based processor
Pen and Touch: No Pen or Touch Input is available for this Display

Computer name, domain, and workgroup settings

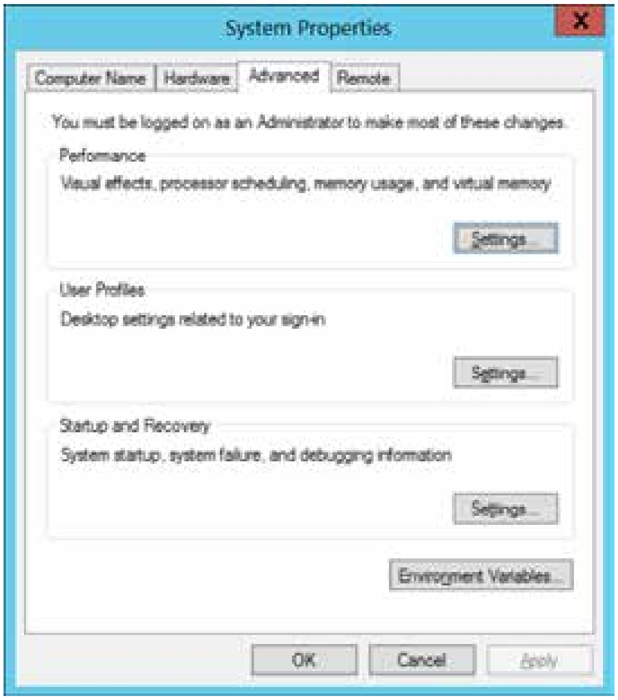
Computer name: TMS7
Full computer name: TMS7.mwcog.org
Computer description: Travel Model Server 7
Domain: mwcog.org

Windows activation

Windows is activated Read the Microsoft Software License Terms

Product ID: 00252-60122-16932-AA613

Click "Advanced system settings." Click the "Advanced" tab.



You must be logged on as an Administrator to make most of these changes.

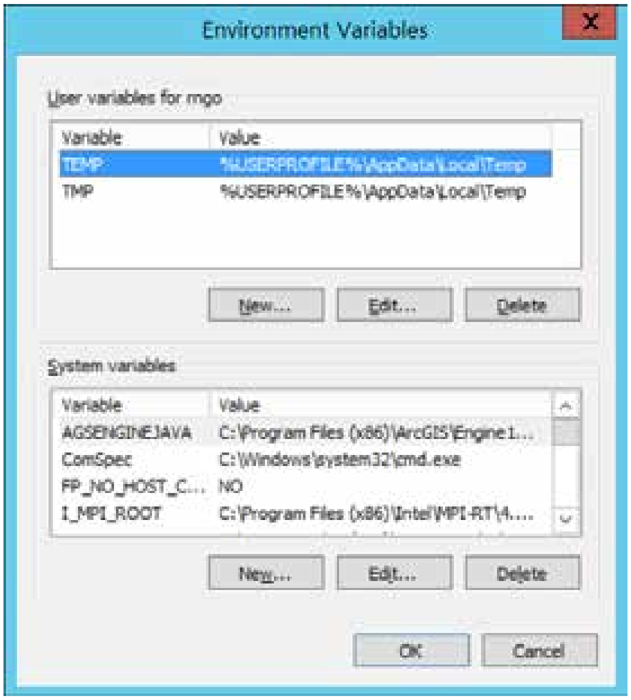
Visual effects, processor scheduling, memory usage, and virtual memory

Desktop settings related to your sign-in

System startup, system failure, and debugging information

Click the "Environment Variables" button.

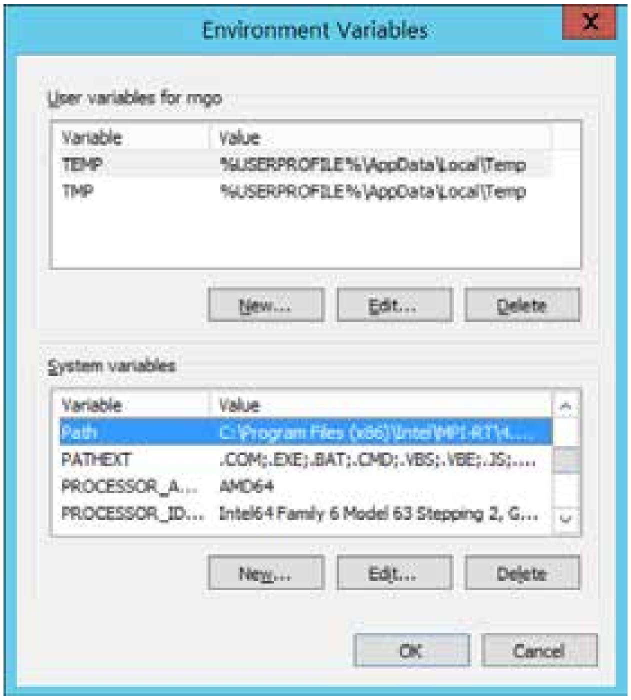
The lower half of this window contains "system variables."



Variable	Value
TEMP	%USERPROFILE%\AppData\Local\Temp
TMP	%USERPROFILE%\AppData\Local\Temp

Variable	Value
AGSENGINEJAVA	C:\Program Files (x86)\ArcGIS\Engine1...
ComSpec	C:\Windows\system32\cmd.exe
FP_NO_HOST_C...	NO
I_MPI_ROOT	C:\Program Files (x86)\Intel\MPI-RT\4....

Find the “Path” environment variable in the lower half of this window.



Variable	Value
TEMP	%USERPROFILE%\AppData\Local\Temp
TMP	%USERPROFILE%\AppData\Local\Temp

Variable	Value
Path	C:\Program Files (x86)\Intel\MPI-RT\4....
PATHEXT	.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;....
PROCESSOR_A...	AMD64
PROCESSOR_ID...	Intel64 Family 6 Model 63 Stepping 2, G...

Click “Edit.”

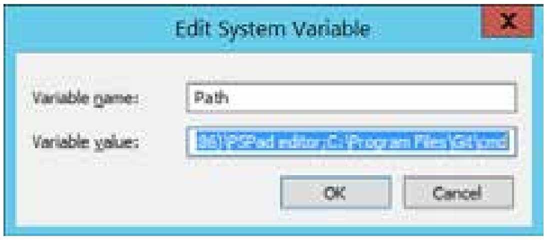
Add the Windows paths that you want. Add these to the end of the Path variable, using a semicolon (“;”) as the separator.

For example, this path:

```
%SystemRoot%\system32;%SystemRoot%;%SystemRoot%\System32\Wbem;%SYSTEMROOT%\System32\WindowsPow
erShell\v1.0\
```

Would become this path:

```
%SystemRoot%\system32;%SystemRoot%;%SystemRoot%\System32\Wbem;%SYSTEMROOT%\System32\WindowsPow
erShell\v1.0\;C:\Program Files (x86)\Citilabs\CubeVoyager;C:\cygwin\bin
```



Variable name: Path

Variable value: 86)\PSPad editor;C:\Program Files\Git\cmd

Click “OK” three times.

To test whether Cygwin is working correctly, open a command window and type a Cygwin command, such as

```
which ls
```

Or

```
tail --help
```

To test Cube Voyager, type:

```
start /w voyager
```

Or

```
cluster
```

Step 9: Useful, but not essential: Install Winmerge and update the PATH environment variable to include:

C:\Program Files\WinMerge

Step 10: You may want to associate *.net files with Cube.exe. This will allow the file i4_assign_output.net to be opened in Cube automatically at the completion of a model run. You may also want to associate *.txt and *.rpt files with your preferred text editor. At the completion of a model run, the “run model” batch file tries to open several of these files (such as i4_Highway_Assignment.rpt). By setting up the desired file association, these files will be opened at the end of the model run using the desired text editor (versus the default Windows text editor, which is Notepad).

5.2 Preparing input files and calculating zonal percent-walk-to-transit values

After a person has requested the COG/TPB travel model from COG/TPB staff (https://www.mwcog.org/transportation/data-and-tools/modeling/data-requests/), he or she will be sent a transmittal memo and the actual travel model, including its inputs. If the user wants to simply run the travel model for the years/scenarios that have been supplied by COG/TPB staff, then there is no need to make any changes to the model inputs (This also pre-supposes that the user has required hardware and software, as specified in this user's guide).

In the Ver. 2.3.66 travel model and earlier versions, one of the first steps in the run_modelSteps batch file was to run the automated transit walkshed process: "call *ArcPy_Walkshed_Process.bat* %1". Due to instabilities with ArcGIS and the ArcGIS runtime engine that is packaged with Cube, the automated transit walkshed process is one of the model steps that is most likely to fail (premature stop or crash). This is especially true with the ArcGIS runtime engine that comes with Cube 6.4.2. For this reason, when we transmit the model to end users, the automated transit walkshed process is turned off (commented out in the run_modelsteps batch file). This is not a problem for most users, since we provide in the inputs folder the primary output file (areawalk) from the automated transit walkshed process. If, however, a user wishes to make changes to the transit network, then we recommend uncommenting this step to allow the automated transit walkshed process to run. The new transit walkshed process is discussed in section 11 ("Building transit walksheds and calculating zonal walk percent") of this report, beginning on p. 95.

6 Running the model

As noted in the "Hardware and software " section, the Version 2.3 Travel Model is implemented using Citilabs Cube software. Cube Base is the graphical user interface (GUI) for the Cube suite of software. Cube base can be used for editing Cube Voyage scripts, editing transportation networks, viewing matrix files, managing network scenarios (Scenario Manager), and running travel models (Application Manager). However, the Version 2.3 Travel Model is not launched using Cube Base's Application Manager. Instead, the Version 2.3 Travel Model is implemented using a command-line interface (CLI) that is initiated from a Windows command window (also called a DOS command window by some, although DOS no longer exists).

6.1 Updating the Windows PATH environment variable

It is important to update the Windows PATH environment variable, as described in section 5.1 ("Software installation and setting the Windows PATH environment variable").

The next section describes a simple example of how to run the travel model. Following that are two sections that describe the wrapper batch file and the "run model steps" batch file in more detail.

6.2 Parent batch files

To run the Version 2.3 Travel Model (including Ver. 2.3.75), the user must edit two batch files and then run one of the batch files, which, in turn, will call the other file. These two batch files are known as the parent batch files, since they call a series of other batch files (known as the child batch files). The first parent batch file is called the "wrapper" batch file or the "run model" batch file (an example can be seen in Figure 16). The second parent batch file is called the "run model steps" (formerly "run all") batch file (an example can be seen in Figure 17). In computer programming, the term "wrapper function" is used for a function whose main purpose is to call a second function and set up a computing environment for that second function. We are using this term in a similar vein, since the main purpose of our wrapper batch file is to call a second batch file (the "run model steps" batch file) and set up the running environment for the model run. Once the user has edited the two parent batch files with a text editor, the user launches the model run by launching the wrapper batch file either directly or within a command prompt window that is pointing to the root directory. For example, if the root directory is "C:\modelRuns\fy18\Ver2.3. 75_aqc_Vis2045", then **the user would open a command prompt window at this location and type the name of the "run model"/wrapper batch file and press Enter to execute it.** This process is described in more detail below, along with some preliminary information needed to make the model run correctly.

There is typically a "run model" batch file and a "run model steps" batch file for each scenario/year that is modeled, e.g.,:

```
run_Model_2019_Final.bat
run_ModelSteps_2019_Final.bat

run_Model_2021_Final.bat
run_ModelSteps_2021_Final.bat

run_Model_2025_Final.bat
run_ModelSteps_2025_Final.bat

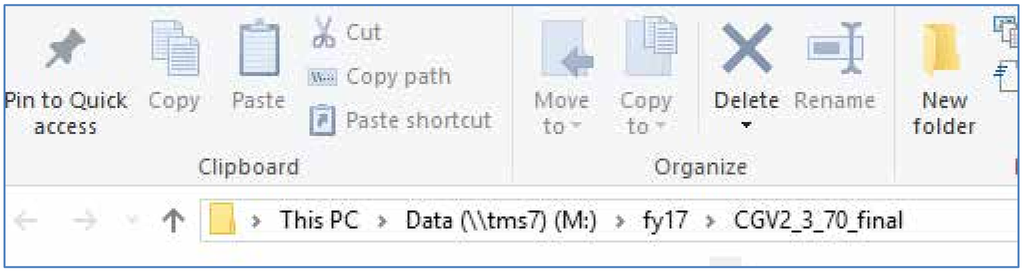
run_Model_2030_Final.bat
run_ModelSteps_2030_Final.bat

run_Model_2040_Final.bat
run_ModelSteps_2040_Final.bat

run_Model_2045_Final.bat
run_ModelSteps_2045_Final.bat
```

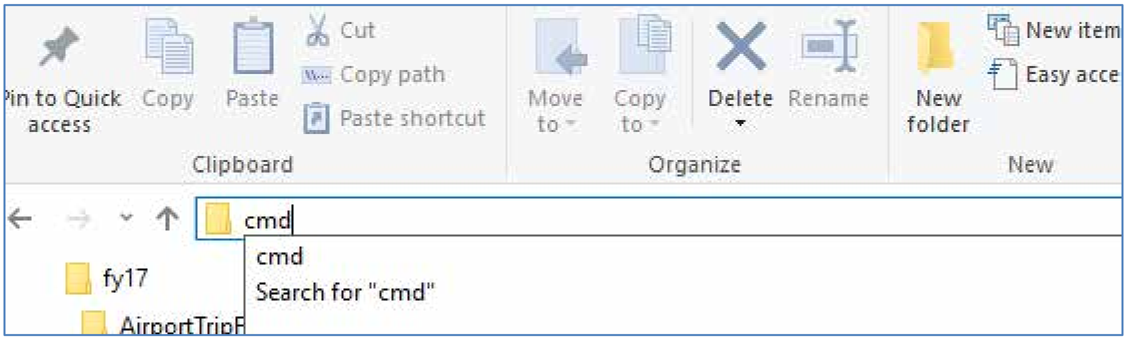
To launch a model run, one needs to open a Windows command window that points to the location where you have placed the parent batch files (the so-called "root" folder). One way to do this is to open Windows Explorer (File Explore in some versions of Windows) and navigate to the root folder, and then select the root folder by clicking it once. In earlier versions of Windows, one would select the folder in the left pane, and then, with nothing selected in the right pane, one would use the mouse to **shift-right-click** in the right pane, selecting "Open Command Window Here." However, in newer versions of Windows, this action results in the option to "Open PowerShell window here." Since the model is currently not run under Windows PowerShell, one should not select this option. Instead, one can do one of the following:

- Either, open a command window using the Windows Start button, and change the directory to the desired directory by using the change directory (CD) command. One can copy the desired path from the address bar of the file explorer:



This PC › Data (\\tms7) (M:) › fy17 › CGV2_3_70_final

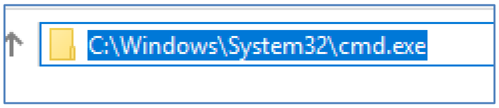
- Or, one can put the cursor in the address bar and type "cmd". This will open a command window whose current path is the path that had been in the address bar of the Windows file explorer:



cmd

cmd
Search for "cmd"

The main drawback to using the second approach is that after one types cmd in the address box, the address box seems to no longer contain the original path, even though the Windows File Explorer still seems to show this location and the files stored in this location. Thus, after one types "cmd" in the address box, when one clicks in the box a second time, one will see this:



C:\Windows\System32\cmd.exe

Figure 16 "Run model" batch file for 2019_Final

```
:: File location
:: Version 2.3.75
:: 2018-09-11 Tue 10:40 AM

set root=.
set scenar=2019_Final
set runbat=run_ModelSteps_2019_Final.bat
:: Environment variables for (multistep) distributed processing:
:: Environment variables for (intrastep) distributed processing:
::     use MDP = t/f (for true or false)
::     use IDP = t/f (for true or false)
::     Number of subnodes:  1-3 => 3 subnodes and one main node = 4 nodes in total
set useIdp=t
set useMdp=t
::  AMsubnode & MDsubnode are used in highway_assignment_parallel.bat/s
set AMsubnode=1-4
set MDsubnode=2-4
::  subnode used in transit fare and transit assignment
::  We no longer use IDP in transit skimming, since it would require 16 cores
set subnode=1-3
```

```

:: This command will
::  1) time the model run (using timethis.exe and the double quotes)
::  2) redirect standard output and standard error to a file
::  3) Use the tee command so that stderr & stdout are sent both to the file and the screen

timethis "%runbat%  %scenar%" 2>&1 | tee %root%\%scenar%\%scenar%_fulloutput.txt

:: Open up the file containing the stderr and stdout
if exist %root%\%scenar%\%scenar%_fulloutput.txt     start %root%\%scenar%\%scenar%_fulloutput.txt

:: Look four errors in the reports and output files
call searchForErrs.bat  %scenar%
:: Open up the file containing any errors found
if exist %root%\%scenar%\%scenar%_searchForErrs.txt  start %root%\%scenar%\%scenar%_searchForErrs.txt

:: Open up other report files
if exist %root%\%scenar%\i4_Highway_Assignment.rpt   start %root%\%scenar%\i4_Highway_Assignment.rpt
if exist %root%\%scenar%\i4_mc_NL_summary.txt        start %root%\%scenar%\i4_mc_NL_summary.txt
if exist %root%\%scenar%\i4_Assign_Output.net        start %root%\%scenar%\i4_Assign_Output.net
cd %scenar%
start powershell.exe -noexit -Command get-content i4_ue*AM_nonHov*txt -tail 1; get-content i4_ue*AM_hov*txt -tail 1;
get-content i4_ue*PM_nonHov*txt -tail 1; get-content i4_ue*PM_hov*txt -tail 1; get-content i4_ue*MD*txt -tail 1;
get-content i4_ue*NT*txt -tail 1
cd ..
move_temp_files_v6.bat %scenar%

:: Cleanup
set root=
set scenar=
set runbat=
set useIdp=
set useMdp=
set AMsubnode=
set MDsubnode=
set subnode=
```

Figure 17 "Run model steps" batch file for 2019_Final

```
:: Version 2.3.75
:: 2018-09-11
:: Version 2.3 TPB Travel Model on 3722 TAZ System

set _year_=2019
set _alt_=Ver2.3.75_2019_Final
:: Maximum number of user equilibrium iterations used in traffic assignment
:: User should not need to change this.  Instead, change _relGap_ (below)
set _maxUeIter_=1000

:: Not set transit constraint path and files
:: Current year no longer used to set the constraint

set _tcpath_=



:: UE relative gap threshold: Progressive (10^-2 for pp-i2, 10^-3 for i3, & 10^-4 for i4)
:: Set the value below

rem ====== Pump Prime Iteration ==========================================

set _iter_=pp
set _prev_=pp
set _relGap_=0.01

REM call ArcPy_Walkshed_Process.bat %1
call Set_CPI.bat                %1
```

```
call PP_Highway_Build.bat       %1
call PP_Highway_Skims.bat       %1
call Transit_Skim_All_Modes_Parallel.bat %1
call Trip_Generation.bat        %1
call Trip_Distribution.bat      %1
call PP_Auto_Drivers.bat        %1
call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
call Highway_Skims.bat          %1

:: rem ====== Iteration 1 ===================================================

set _iter_=i1
set _prev_=pp

call Transit_Skim_All_Modes_Parallel.bat %1
call Transit_Fare.bat           %1
call Trip_Generation.bat        %1
call Trip_Distribution.bat      %1
call Mode_Choice_Parallel.bat      %1
call Auto_Driver.bat            %1
call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
call Highway_Skims.bat          %1

:: rem ====== Iteration 2 ===================================================

set _iter_=i2
set _prev_=i1

call Transit_Skim_All_Modes_Parallel.bat %1
call Transit_Fare.bat           %1
call Trip_Generation.bat        %1
call Trip_Distribution.bat      %1
call Mode_Choice_Parallel.bat      %1
call Auto_Driver.bat            %1
call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
call Average_Link_Speeds.bat    %1
call Highway_Skims.bat          %1

:: rem ====== Iteration 3 ===================================================

set _iter_=i3
set _prev_=i2
set _relGap_=0.001

call Transit_Skim_All_Modes_Parallel.bat %1
call Transit_Fare.bat           %1
call Trip_Generation.bat        %1
call Trip_Distribution.bat      %1
call Mode_Choice_Parallel.bat      %1
call Auto_Driver.bat            %1
call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
call Average_Link_Speeds.bat    %1
call Highway_Skims.bat          %1

:: rem ====== Iteration 4 ===================================================

set _iter_=i4
set _prev_=i3
set _relGap_=0.0001

call Transit_Skim_All_Modes_Parallel.bat %1
call Transit_Fare.bat           %1
call Trip_Generation.bat        %1
call Trip_Distribution.bat      %1
```

```
97      call Mode_Choice_Parallel.bat      %1
98      call Auto_Driver.bat            %1
99      call Time-of-Day.bat            %1
100     call Highway_Assignment_Parallel.bat     %1
101     call Average_Link_Speeds.bat    %1
102     call Highway_Skims.bat          %1
103
104     :: rem ====== Transit assignment =============================================
105     @echo Starting Transit Assignment Step
106     @date /t & time/t
107
108     call Transit_Assignment_Parallel.bat %1
109     call TranSum.bat %1
110
111     @echo End of batch file
112     @date /t & time/t
113     :: rem ====== End of batch file =============================================
114
115     REM cd %1
116     REM copy *.txt MDP_%useMDP%\*.txt
117     REM copy *.rpt MDP_%useMDP%\*.rpt
118     REM copy *.log MDP_%useMDP%\*.log
119     REM CD..
120
121     set _year_=
122     set _alt_=
123     set _iter_=
124     set _prev_=
125     set _maxUeIter_=
126     set _relGap_=
```

127

6.2.1 Description of the "run model"/wrapper batch file

The first three lines of the "run model" batch file shown in Figure 16 are simply comments. Comments in batch files can be indicated using either a double colon ("::") or the word REM at the start of the line.[52] In line #5, we define a Windows environment variable called "root" and set its value to ".", which simply means the current directory location (i.e., the current directory where one has opened a command prompt). In line #6, we define an environment variable called "scenar" (scenario) and set its value to the model scenario/year we want to run (in this case, 2019_Final, but any string may be used, such as "2030_lowGrowth"). In line #7, we define an environment variable named "runbat" which is used to store the name of the "run model steps" batch file that we will use for the year-2019 model run. Lines 13-20 is where one sets the environment variables that control distributed processing. Distributed processing is covered in more detail later in this report.

Line 27 is the actual line that runs the model. The "timethis" command is used to time how long the command takes to run. In this case, the command being timed is the entire model run. The "2>&1" and "tee" sections of line 27 are explained next. When a program is run in a command-line interface, such as the Windows command window, there are two streams of output information: standard output and standard error. Standard output is information that the program supplies to a user while the program is running, such as messages about finishing a step, or the current TAZ number that is being processed. Standard error is information about errors that occur while running a program, for example, "file not

---

[52] A single colon (":") before a word indicates a label, which is often the target of a GOTO statement.

found." Normally, both the standard output stream and the standard error stream are sent to the screen (in this case, the Windows command window). However, since model run last many hours, it is not practical for a model user to watch the screen to see what messages occur during the model run. One solution is to redirect these two information streams to a file, instead of the screen, which allows one to review the contents of the file after the model run is completed. The "2>&1" keyword redirects both standard error and standard output to one file (in this case, the file ending with "_fulloutput.txt"). However, the drawback to this approach is that the model user will not see any real-time information on the screen, since all the information is being sent to a file. An alternate approach is to combine the use of "2>&1" with the "tee" command, which splits any stream of information into two streams of identical information. The result of using these two keywords together is that the standard output and standard error streams are sent both to the screen and to a file at the same time. Line 30 simply opens, at the conclusion of the model run, the file containing the standard output and standard error information. The Tee.exe utility program is part of the Windows 2000 Resource Kit.

Line 33 calls a batch file that searches reports and output files for certain errors. Line 35 simply opens this file containing the listing of errors. It should be noted that this file was mainly used for model development, **so it contains little useful information for the average model user. For the average model users, the key file to review is the one that combines the standard output and error information ("_fulloutput.txt")**.

Lines 38 through 40 contain commands which opens other report files, after the model run has completed**. Line 42** (which is so long that it stretches over three lines in Figure 16) contains a PowerShell command that opens a window showing some summary convergence metrics for traffic assignment. **Lastly, line 46 runs the cleanup process**, which divides model output files into two sets: files to keep and temporary files that can be deleted. At the completion of a model run, there are about 26 GB of output files, many of which are temporary or non-final versions of files. The move_temp_files_v6.bat batch file creates the folder "temp_files" and moves about 16 GB of the 26 GB of files to the temp_files folder. **To save disk space, the user can then either delete the temp_files folder or the contents of the temp_files folder** (such as using Windows File Explorer). The advantage of deleting the *contents* of the temp_files folder, but not the folder itself, is that, in multi-user environments, it will be apparent to other model users that the cleanup process has already been run.

6.2.2 Description of the "run model steps" batch files

As stated earlier, there is a "run model steps" batch file for each model run scenario/year. In previous versions of the travel model, such as Ver 2.3.70, these "run model steps" batch files were structured to implement three special modeling procedures:

1. Metrorail constraint to and through the regional core.
2. HOT3+: HOT lanes with free access for HOV3+ (e.g., I-495 and I-95 Express Lanes).
3. HOT2+: HOT lanes with free access for HOV2+ (e.g., I-66 inside the Beltway for 2017-2020).

However, as explained in sections 1.3 and 2.4, starting with the Ver. 2.3.75 model, COG/TPB staff has eliminated the use of the Metrorail constraint to and through the regional core and also the HOV3+ skim substitution technique for modeling HOT lanes. These changes simplify the development of the "run model steps" batch files, since we now use the same batch file structure for all scenarios of Ver 2.3.75. The setup now excludes HOV2 and HOV3+ skim replacement and the Metrorail constraint procedures (in the past, the Metrorail constraint procedure required extra attention for modeled years after 2020, which had been the constraint year in the past).

Table 14 shows the key changes in three scenario representatives of Ver. 2.3.70 and Ver 2.3.75. For example, the HOV3+ skim replacement procedure, which was invoked in Ver 2.3.70 in the model run representing year-2019 conditions (since HOT lanes existed in that scenario), is not called in Ver 2.3.75. Similarly, the Metrorail constraint and the HOV3+ skim replacement components are not invoked in the year-2040 model run from Ver 2.3.75. **Thus, a "base" scenario is not needed; only a "final" scenario is now needed to run any modeled year**. The final scenario can be called "2019_final" or simply "2019". In Ver 2.3.75, the environment variable "_tcpath_" (transit constraint path) is set to blank/null for all scenarios since the Metrorail constraint path is not needed. Also, the HOV3+ skim substitution/replacement technique is not used in the "run model steps" batch files of all scenarios, this means that the "_HOV3PATH_" environment variable is removed (see Figure 17). Although 2020 is not a conformity year in Visualize 2045, Table 14 still shows the differences between 2020_final scenario model-step batch files of these two versions.

Table 14 Summary of differences to the "run model steps" batch files for the years 2019, 2020, and 2045 in Ver 2.3.70 and Ver 2.3.75

	Year / Scenario model runs		**Metrorail constraint through regional core?**		**HOV2+ skim substitution technique for modeling HOT lanes?**		**HOV3+ skim substitution technique for modeling HOT lanes?**	
	V2.3.70	**V2.3.75**	**V2.3.70**	**V2.3.75**	**V2.3.70**	**V2.3.75**	**V2.3.70**	**V2.3.75**
2019	2019_base	**N/A**	Not used (2020 is constraining year) i.e., "set _tcpath_="	N/A	N/A	N/A	No (Base HOV3+ skims are estimated) i.e., "set _HOV3PATH_="	N/A
	2019_final	2019_final	Not used (2020 is constraining year) i.e., "set _tcpath_="	Not used "set _tcpath_="	N/A	N/A	**Yes** (Base HOV3+ skims are used from the "base" run) i.e., "set _HOV3PATH_=..\2019_base"	**Removed**
2020	2020_base	**N/A**	2020 is the year used to set the constraint, but no change is made to batch file i.e., "set _tcpath_="	N/A	No (Base HOV2&3+ skims are estimated) i.e., "set _HOV3PATH_="	N/A	No (Base HOV3+ skims are estimated) i.e., "set _HOV3PATH_="	N/A
	2020_final	2020_final	2020 is the year used to set the constraint, but no change is made to batch file i.e., "set _tcpath_="	Not used "set _tcpath_="	**Yes** (Base HOV2&3+ skims are used from the "base" run) i.e., "set _HOV3PATH_=..\2020_base"	**Removed**	**Yes** (Base HOV3+ skims are used from the "base" run) i.e., "set _HOV3PATH_=..\2020_base"	**Removed**
2040	2040_base	**N/A**	**Yes** e.g., "set _tcpath_=..\2020_final"	N/A	N/A	N/A	No (Base HOV3+ skims are estimated) i.e., "set _HOV3PATH_="	N/A
	2040_final	2045_final	**Yes** e.g., "set _tcpath_=..\2020_final"	**Removed** "set _tcpath_="	N/A	N/A	**Yes** (Base HOV3+ skims are used from the "base" run) i.e., "set _HOV3PATH_=..\2040_base"	**Removed**

Regarding the 2040_final scenario, whose "run model steps" batch file is shown in Figure 18, Table 14 shows that Ver. 2.3.75 is not using the Metrorail constraint process anymore. Thus, there are four changes to the batch file shown in Figure 18. These changes are highlighted in yellow. First, the "_tcpath_" environment variable is no longer set to the location containing the Metrorail trips for the constraint year, 2020 (see line 16 in Figure 18). Although we could have removed this command entirely from the batch file, we have chosen to leave it there, but with a blank argument, in case, in the future, there would be a need to re-apply the Metrorail constraint. Second, line 32 of Figure 18 is highlighted to indicate that *PP_Highway_Skims.bat* has been modified to adding a check to ensure that no rail stations are disconnected from the road network. Third, the lines that call the Metrorail constraint mode choice process ("call *Mode_Choice_TC_V23_Parallel.bat*") have been changed to apply the mode choice process without constraint ("call *Mode_Choice_Parallel.bat*"). These changes have been highlighted in lines 50, 65, 82, and 99 in Figure 18. Fourth, regarding the modeling of HOT lanes, Table 14 shows us that, a "final" scenario is no longer needed to apply the HOV3+ skim substitution/replacement technique, so we no longer need to designate the location of the HOV3+ baseline skims. Thus, the "_HOV3PATH_" environment variable is removed and the *Highway_Skims.bat* is used instead of *HSR_Highway_Skims.bat* (see lines 39, 54, 70, 87, and 104 in Figure 18).

Figure 18 "Run model steps" batch file for 2040_final

```
1   :: File location
2   :: Version 2.3.75
3   :: 2018-09-10 Mon 03:40 PM
4
5   :: Version 2.3 TPB Travel Model on 3722 TAZ System
6
7   set _year_=2040
8   set _alt_=Ver2.3.75_2040_Final
9   :: Maximum number of user equilibrium iterations used in traffic assignment
10  :: User should not need to change this.  Instead, change _relGap_ (below)
11  set _maxUeIter_=1000
12
13  :: Not set transit constraint path and files
14  :: Current year no longer used to set the constraint
15
16  set _tcpath_=
17
18
19
20  :: UE relative gap threshold: Progressive (10^-2 for pp-i2, 10^-3 for i3, & 10^-4 for i4)
21  :: Set the value below
22
23  rem ====== Pump Prime Iteration ==========================================
24
25  set _iter_=pp
26  set _prev_=pp
27  set _relGap_=0.01
28
29  REM call ArcPy_Walkshed_Process.bat %1
30  call Set_CPI.bat                %1
31  call PP_Highway_Build.bat       %1
32  call PP_Highway_Skims.bat       %1
33  call Transit_Skim_All_Modes_Parallel.bat %1
34  call Trip_Generation.bat        %1
35  call Trip_Distribution.bat      %1
36  call PP_Auto_Drivers.bat        %1
37  call Time-of-Day.bat            %1
38  call Highway_Assignment_Parallel.bat     %1
```

```
call Highway_Skims.bat          %1

:: rem ====== Iteration 1 ===================================================

set _iter_=i1
set _prev_=pp

call Transit_Skim_All_Modes_Parallel.bat %1
call Transit_Fare.bat           %1
call Trip_Generation.bat        %1
call Trip_Distribution.bat      %1
call Mode_Choice_Parallel.bat      %1
call Auto_Driver.bat            %1
call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
call Highway_Skims.bat          %1

:: rem ====== Iteration 2 ===================================================

set _iter_=i2
set _prev_=i1

call Transit_Skim_All_Modes_Parallel.bat %1
call Transit_Fare.bat           %1
call Trip_Generation.bat        %1
call Trip_Distribution.bat      %1
call Mode_Choice_Parallel.bat      %1
call Auto_Driver.bat            %1
call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
call Average_Link_Speeds.bat    %1
call Highway_Skims.bat          %1

:: rem ====== Iteration 3 ===================================================

set _iter_=i3
set _prev_=i2
set _relGap_=0.001

call Transit_Skim_All_Modes_Parallel.bat %1
call Transit_Fare.bat           %1
call Trip_Generation.bat        %1
call Trip_Distribution.bat      %1
call Mode_Choice_Parallel.bat      %1
call Auto_Driver.bat            %1
call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
call Average_Link_Speeds.bat    %1
call Highway_Skims.bat          %1

:: rem ====== Iteration 4 ===================================================

set _iter_=i4
set _prev_=i3
set _relGap_=0.0001

call Transit_Skim_All_Modes_Parallel.bat %1
call Transit_Fare.bat           %1
call Trip_Generation.bat        %1
call Trip_Distribution.bat      %1
call Mode_Choice_Parallel.bat      %1
call Auto_Driver.bat            %1
call Time-of-Day.bat            %1
call Highway_Assignment_Parallel.bat     %1
call Average_Link_Speeds.bat    %1
call Highway_Skims.bat          %1

:: rem ====== Transit assignment ============================================
```

```
107  @echo Starting Transit Assignment Step
108  @date /t & time/t
109
110  call Transit_Assignment_Parallel.bat %1
111  call TranSum.bat %1
112
113
114
115  @echo End of batch file
116  @date /t & time/t
117  :: rem ====== End of batch file =============================================
118
119  REM cd %1
120  REM copy *.txt MDP_%useMDP%\*.txt
121  REM copy *.rpt MDP_%useMDP%\*.rpt
122  REM copy *.log MDP_%useMDP%\*.log
123  REM CD..
124
125  set _year_=
126  set _alt_=
127  set _iter_=
128  set _prev_=
129  set _maxUeIter_=
130  set _relGap_=
```

All two of the “run model steps” batch files (Figure 17 and Figure 18) apply the progressive relative gap procedure by using the “_relGap_” environment variable. For example, the relGap variable starts at a value of 0.01 (10^-2) on line 27 in Figure 18, and then changes to 0.001 (10^-3) on lines 76, before attaining the final value of 0.0001 (10^-4) on line 93 in speed-feedback iteration 4. This is covered in more detail in the text surrounding both Table 6 and Table 86.

6.3 Running the model: An example

This section provides an example of how to run the travel model for the year 2019 (named “2019_final”) using the travel model package that is typically transmitted to external users. It is assumed that the user has copied the transmitted model into the folder where it will be run and did not modify any input files or folder names. The top-level folder is referred to as the “root” folder and typically has a name referring to the travel model version and the specific modeling project (e.g. “Ver2.3. 75_aqc_Vis2045”). The root folder contains all the batch files and modeling folders (shown in Figure 11). The folder/subdirectory called “2019_final” is referred to as the “outputs” folder or the “scenario-specific” folder. It should also be noted that, to follow the steps below, one should have followed all the steps in Chapter 5 (“Preparing to run the model”). It is also assumed that you are not making any changes to the default parallel processing setup in the model, which requires a computer with eight cores. Otherwise, see instructions found in Table 19 on p. 84.

1. Ensure that the root folder has the two parent batch files:
    a. *run_Model_2019_final.bat*, which is known as the wrapper batch file or the “run model” batch file.
    b. *run_ModelSteps_2019_final.bat*, which is known as the “run model steps” batch file.
2. These two batch files are ready to go and should not need any editing for a normal model run. However, the general practice would be to open the wrapper file in a text editor (do not double click it, since this will launch the model run) and check the following:

   a. The "root" environment variable should be set equal to "." (which means the current working directory, i.e., the current folder in your command window)
   b. The "scenar" environment variable should be set equal to "2019_final"
   c. The "runbat" environment variable should be set equal to "*run_ModelSteps_2019_final.bat*" (which is the relevant "run model steps" batch file)
   d. Other environment variables, such as those used for distributed processing, are explained in the chapter on parallel processing.

3. Open a command window and navigate to the root folder OR

   Use Windows Explorer/File Explorer to navigate to the root folder using the method described in section 6.2 ("Parent batch files"), which begins on page 57).

4. Type "*run_Model_2019_final.bat*" (without the quotes) and hit Enter.

The model run should begin, and the user should see numerous commands scrolling in the command window.

7 Summarizing model output and other utilities

7.1 Summary Scripts

In addition to the model, the user is provided with a number of summary scripts, which may be helpful in analyzing the model output. These are listed in Table 15.

Table 15 Travel Model Summary Scripts

Summary script	**Description**	**Folder**
COMPARE_NL_MC.S	Compares **estimated** mode choice results between two different model runs.	summary
COMPARE_NL_MC_Cube61vsCube64.S	Compares **estimated** mode choice results between two different model runs.	summary
COMPARE_NL_MC_Expanded_Alt_V23_52_minus_Base_V23_39.S	Compares alternative developed with V2.3.52 and base developed with V.2.3.39. Such a script is needed because naming conventions for output files changed between Build 39 and Build 52.	summary
Compare_Trip_Distribution.s	Compares **estimated** trip distribution to **observed** trip distribution from HTS	summary
Diff_Plots_Rev2.s	Plots volume differences between two input networks	summary
Retrieve_Pros_SubAreas.s	Summarize estimated productions and attractions by purpose and mode.	summary
Screen_Analysis.s	Performs analysis of traffic assignment volumes by screenline	summary
Summarize_2007_2040_Screenlines.s	Compares estimated screenlines volumes in 2007 and 2040	summary
Summarize_Est_Obs_Volume_Daily.s	Compares **estimated** daily traffic volumes on select links to **observed** counts. Also compares **estimated** and **observed** daily screenline volumes.	summary
Summarize_Est_Obs_Volume_Period.s	Compares **estimated** AM, MD, PM, and NT volumes on select links to **observed** counts.	summary
view_from_space_v2.3.75.s	Creates global summary of demographic info, trips, and VMT.	summary
RMSE_Calc.s	Creates summaries of link counts and percent root mean squared error between estimated link volumes and observed counts.	assignment_summary
ScreenLine_Summary.s	Merges counts on to a network.	assignment_summary
TVOLDIF_Plot.s	Plots volume differences between two input networks	assignment_summary

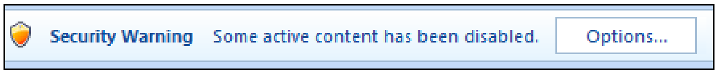
Additionally, the program LineSum.exe is used for summarizing the transit assignment (see Chapter 24 ("Transit Assignment, Including Summary Process (LineSum)").

7.2 Utilities

The Version 2.3 Travel Model requires many input files in various file formats. One of the file formats is dBase or DBF. Compared to space-delimited text files, DBF files have several advantages (e.g., fields do not mistakenly run together when values become large), but DBF files can also have some drawbacks, e.g., they can be difficult to create, and it can be difficult to compare two DBF files. On this second issue, there are several utilities for comparing or "diffing" text files (such as the Unix/Linux `diff` command, WinDiff, WinMerge, PSPad, and Notepad++), but it is more difficult to find programs that allow one to compare DBF files. To facilitate such comparison, a member of the TPB staff, Feng Xie, has developed a utility, known as the DBF Converter (DBF_Converter_v3.2.xls) that enables the user to convert DBF files to text files in comma-separated variable (CSV) format. This conversion can also be done within Cube (using File > Export). Once the files are converted to CSV format, it is easier to compare or "diff" them using other existing utilities. TPB staff is making this DBF converter available to users of the regional travel model to aid in checking/comparing input files.

Using the DBF converter, the user has the option of converting all DBF files in a directory or a select subset of the files. This utility requires Microsoft Office Excel software.

To begin the process, the user double clicks on the converter file/icon (DBF_Converter_v3.2.xls), which will open an Excel spreadsheet. In the center of the spreadsheet, there is a "Start" button. Before clicking on this button, the user has to enable the button by clicking on the "Options…" button:



Security Warning Some active content has been disabled.

When prompted, the user will have to click "Enable this content" and "OK":

Microsoft Office Security Options

Security Alert - Macros & ActiveX

Macros & ActiveX

Macros and one or more ActiveX controls have been disabled. This active content might contain viruses or other security hazards. Do not enable this content unless you trust the source of this file.

Warning: It is not possible to determine that this content came from a trustworthy source. You should leave this content disabled unless the content provides critical functionality and you trust its source.

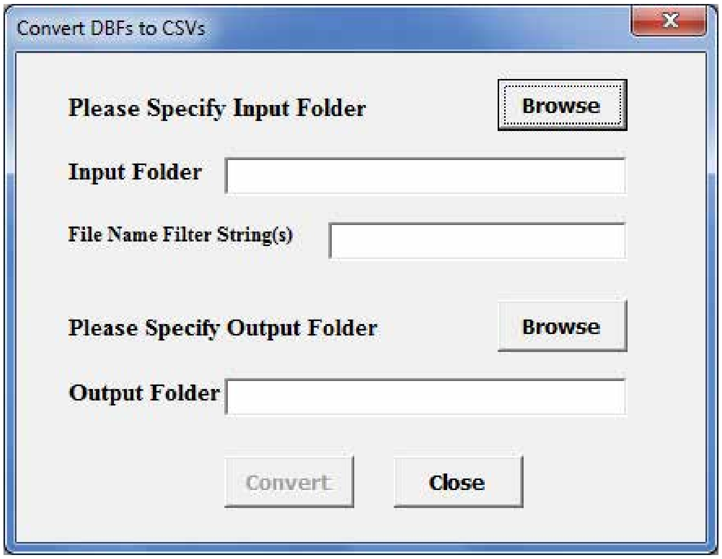
File Path: X:\modelRuns\fy12\Ver2.3.37_conf\DBF_Converter_v3.2.xls

○ Help protect me from unknown content (recommended)

● Enable this content

Now, the user can click on the "Start" button:

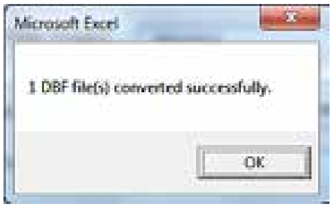
This will result in the following pop-up window prompting the user to enter the input folder, output folder, and the file name filter string(s):



The input folder must contain the DBF files that the user wishes to convert. The output folder is the folder where the newly created CSV files will be placed. The Input/Output folders can be specified by either by clicking the "Browse" button or by typing/pasting in the text boxes. Once the user has selected the input and output folders, he or she may wish to specify a file name filter string. The filter string textbox allows multiple filter strings, separated by spaces. If the user would like to convert all DBF files in the input folder, then the "File Name Filter String(s)" field should be left blank.[53] However, if the user wishes to convert only one DBF file or only a subset of DBF files in the input folder, he or she should specify either a full or partial file name. When the fields are filled, the user needs to press the "Convert" button. Once the conversion process is complete, the user will see a pop-up window stating that the DBF file(s) were converted successfully.

---

[53] Note, however, that this can take several minutes, since there are over 100 files.



1 DBF file(s) converted successfully.

Once the converter has run, the user can find the newly created CSV file(s) in the specified output folder.

8 Use of parallel processing to reduce model run times

8.1 Model run times

In the period from 2008 to 2011, when COG/TPB staff had first transitioned from the Version 2.2 Travel Model to the Version 2.3 Travel Model, we noticed that the Version 2.3 model required much longer run times. For example, using a server bought in 2009 (such as COG's travel model server 3, or tms3), a run of the Ver. 2.2 Travel Model took 15-20 hours, whereas a run of the Version 2.3 Travel Model required about 80-90 hours initially (a factor of 4.5 times or 350%), which was later reduced to about 30 hours in 2012 by using Cube Cluster, Citilabs' implementation of distributed processing. On a newer travel model server, such as tms8 or tms7, the model run time is about 13 - 17 hours.

There are several reasons why the Version 2.3 Travel Model, when it was first developed, had such long run times, compared to its predecessor, the Version 2.2 Travel Model. First, the number of transportation analysis zones (TAZs) increased from 2,191 to 3,722. This represents a 70% increase in the number of TAZs and a 189% increase in matrix sizes used to store trip tables and travel time skims ($3{,}722^2/2{,}191^2$). The other factors causing longer run times are associated mainly with refinements to the Version 2.2 traffic assignment process:

- The number of time-of-day periods went from three (AM, PM, and off peak) to four (AM, midday, PM, night/early morning)
- The number of user classes went from five to six (an explicit commercial-vehicle user class has been added);
- The number of traffic assignments has increased. The Version 2.2 Travel Model had originally used three traffic assignments, one for each time-of-day period (AM, PM, and off peak). Later versions of the Version 2.2 Travel Model split the peak assignments into two groups (HOV3+ and non-HOV3+, the so called "two step traffic assignment"), resulting in the five assignments shown in the left-hand column of Table 16. In the Version 2.3 Travel Model, the off-peak period has been further split into two parts: midday and night/early morning. So, the number of traffic assignments has increased from five in Version 2.2 to six in Version 2.3.
- Higher convergence thresholds
    - In the Version 2.2 model, all five traffic assignments were run with 60 user equilibrium (UE) iterations. This resulted in a range of relative gaps values, from a low value of 1.10 x 10^{-4} (0.0001) for the AM HOV3+ assignment to a high of 1.19 x 10^{-2} (0.0119) for the AM non-HOV3+ assignment.[54] [55]
    - In the Version 2.3 model, prior to Build 52, all six traffic assignments were run to either a relative gap of 0.001 (1 x 10^{-3}) or 300 user equilibrium iterations, whichever came first.

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[54] From a model run representing year-2002 conditions from the air quality conformity determination of the 2009 CLRP/FY 2010-2015 TIP.

[55] The modeler can check the relative gap by consulting the highway assignment report file for the final speed feedback iteration (i.e., i4_Highway_Assignment.rpt). The variable is called RELGAP.

For travel model versions 2.3.52 through 2.3.75, we use a **progressively tightening relative gap** procedure, which is described in more detail later in this chapter.

Table 16 Five traffic assignments in the Version 2.2 travel model became six in the Version 2.3 travel model

Version 2.2 model: Five assignments	Version 2.3 model: Six assignments
AM Non-HOV3+	AM Non-HOV3+
AM HOV3+	AM HOV3+
PM Non-HOV3+	PM Non-HOV3+
PM HOV3+	PM HOV3+
Off peak	Midday
	Night and early morning

8.2 Use of parallel processing to reduce model run times

One way to reduce model run times is to buy quicker hardware. However, there are limits to this approach, given the recent trend of chip makers, such as Intel, to focus less on increasing clock speeds and focus more on increasing the number of cores (i.e., the capacity) of computer processors. As evidence of this trend, one of COG's travel model servers, tms6, has a processor whose clock speed is 16% *slower* than that of its predecessor (travel model server #5, or tms5). By contrast, the number of cores has gone from 12 physical cores (24 virtual cores with Hyper-Threading) in tms5 to 16 physical cores (32 virtual cores with Hyper-Threading) in tms6. Consequently, we have focused on achieving run time reductions via the software side of the equation. COG's newest travel model server, tms8, has a clock speed of 3.2 GHz, has two processors, each with 12 physical cores, which, with Hyper-Threading turnd on, appears to the operating system as 48 logical processors (virtual cores), as noted in Table 7.

We use the term "parallelization" to mean running two or more processes or threads in parallel. By running two or more steps in parallel, one can reduce model run time. A common way to achieve this parallelization is by using distributed processing, which essentially distributes the computing load across multiple computer processors or cores. These computer processors/cores could be in separate computers (linked by a local area network or LAN) or could be on one computer that has multiple cores. Citilabs has its own implementation of distributed processing called Cube Cluster, which is an add-on component of Cube Voyager. There are two forms of distributed processing available in Cube Cluster:

- "Intrastep distributed processing (IDP): This type of distributed processing works by breaking up zone based processing in a single step into zone groups that can be processed concurrently on multiple computing nodes. Currently only the Matrix and the Highway programs are available for IDP."[56]
- "Multistep distributed processing (MDP): This type of distributed processing works by breaking up blocks of one or more modeling steps and distributes them to multiple computing nodes to process. This can be used for any program in Cube Voyager as well as user-written programs

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[56] Citilabs, Inc., "Cube Voyager Reference Guide, Version 6.4.1" (Citilabs, Inc., September 30, 2015), 1124–25.

> with the caveat that the distributed blocks and the mainline process must be logically independent of each other."[57]

The Version 2.3. Travel Model uses both IDP and MDP, and uses a third method of parallelization that is already part of the Windows operating system: Running programs in parallel using multiple concurrent command windows.

8.2.1 Background and terminology

A computer contains a central processing unit (CPU), which is also known as a chip or processor. Modern CPUs are often divided into two to ten. A core functions as a separate processor, so, to an operating system, a computer with two CPUs is the same as a computer with one CPU divided into two cores. The two biggest chip manufacturers for computers running the Microsoft Windows operating system are Intel and AMD. COG/TPB staff has run the Version 2.3 Travel Model on only computers with Intel chips, but the model should run on computers with any Intel-like chip, such as AMD. Some Intel chips feature a technology known as Hyper-Threading. When Hyper-Threading technology is enabled on the chip, the operating system sees double the number of cores. So, if your computer has four cores and Hyper-Threading is enabled, the operating system will see eight virtual cores (or "logical processors"), thus doubling your CPU capacity. **Thus, a computer with one CPU that contains four cores and has Hyper-Threading enabled, should be able to run the Version 2.3 Travel Model "out of the box" without making changes to the "run model"/wrapper batch file, since such a computer has eight virtual cores**.[58] When a computer executes a task, it uses a process or "thread." In general, one process or thread runs on one processor or core. The operating system (Microsoft Windows) chooses the actual physical core to use when running a process. If one opens the Resource Manager within Windows Task Manager, one can see that the operating system appears to randomly move the task from one core to the next until the process completes, but the user need not focus on this detail. Cube Base documentation does briefly discuss Hyper-Threading.[59]

In Cube Cluster parlance, a set of processors that can be used for a computing task, whether they exist in one computer or a network of computers is called a "cluster." Any individual processor or core is called a "computing node" or simply a "node." Cube Cluster, which is a part of Cube Voyager, allows the nodes in the cluster to communicate, so that they can work together, essentially running in parallel, to accomplish a computing task. Citilabs originally wrote Cube Cluster with the idea that users would want to harness the power of multiple, run-of-the-mill PCs that were networked together using a local area network (LAN). However, COG/TPB staff has not used Cube Cluster in that way. Instead, COG/TPB staff has harnessed the power of Cube Cluster by running on one computer (server) at a time, by virtue of the

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[57] Citilabs, Inc., 1125.

[58] According to one external user who had a computer with only four cores (though it was not clear whether these were physical cores or virtual cores), the user found that the model crashed at the mode choice step. This was likely due to the fact that the default configuration of the model is designed to run five concurrent mode choice runs. However, this user was able to follow the procedures listed in Table 19 to get the model to run on the four-core computer.

[59] Citilabs, Inc., "Cube Base Reference Guide, Version 6.4.1" (Citilabs, Inc., September 30, 2015), 10–11.

fact that the computer contained multiple cores. If you are running Cube Cluster across multiple computers, you would have a main computer, known as the "main node," and one or more helper computers, known as "sub-nodes" (or "subnodes"). When running Cube Cluster in a single computer with multiple cores, the "main node" and "sub-nodes" would then exist within the same CPU. So, continuing with the single-computer scenario, the user can think of a model run as occurring on a "main node" (which is simply one of the cores on the CPU), and the main node can then call upon one or more sub-nodes (other cores on the CPU) to make use of IDP or MDP.

8.2.2 Effect of Cube Cluster on modeled results

It should be noted that **using Cube Cluster can result in numerical rounding which can affect model results**. For instance, COG/TPB staff found that the use of IDP resulted in a very small change in the estimated VMT coming out of the travel model.[60] As part of a series of test conducted in 2011, COG/TPB staff conducted two model runs: 1) a year-2007 traffic assignment with IDP using 4 cores; and 2) a year-2007 traffic assignment without IDP (i.e., one core). COG/TPB staff then calculated the VMT difference between the two runs at the regional level, the jurisdiction level, and the link level. At the regional level, the use of IDP had almost no effect on modeled results – it resulted in only a 1/100th to 3/100ths of a percent drop in estimated VMT (slide 25). At the jurisdiction level, the use of IDP also resulted in almost no difference in estimated VMT – the difference was as large as 9/100ths of a percent for some jurisdictions (slide 27). At the link level, however, the use of IDP resulted in several cases where the VMT difference was above 20% (slide 29). Fortunately, the links with the largest volume differences were the lower-class facilities (e.g., not freeways). Both runs were done as part of the full travel model and both were done using Cube Voyager/Cluster version 5.1.2. Newer versions of Cube Voyager/Cluster are now available (e.g., COG is now using 6.4.1), but COG/TPB staff have not re-tried the sensitivity test with the newer versions of Cube Voyager. COG/TPB staff shared these results with Citilabs and, in 2012, Citilabs updated its documentation to note this rounding phenomenon. For example, in the Cube 6.4.1 Cube Voyager Reference Guide from 2015: "Use of Cluster can have a very small effect on volumes generated by the HIGHWAY program. During the ADJUST phase, when iteration volumes are combined, the final assigned volumes might vary slightly over different numbers of cluster nodes."[61]

8.2.3 History of adding parallelization to the Version 2.3 Travel Model

In Build 16 of the Version 2.3 Travel Model (Ver. 2.3.16), COG/TPB staff added IDP to the highway assignment script. Staff set the travel model up to use four cores, and, based on the findings of various tests, staff recommended that users who wanted to replicate COG results also use four cores. In Builds 20 through 24 of the Version 2.3 Travel Model, COG/TPB staff added IDP to other modeling steps, such as *MFARE2.s*, *Time-of-Day.s*, and the transit skimming scripts. In 2012, COG asked for AECOM's assistance to further reduce model run times. AECOM suggested model changes that introduced MDP to

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[60] See slides 25-32 of Ronald Milone and Mark S. Moran, "TPB Version 2.3 Travel Model on the 3,722-TAZ Area System: Status Report" (May 20, 2011).

[61] Citilabs, Inc., "Cube Voyager Reference Guide, Version 6.4.1," 1129.

the travel model.[62] Now, in addition to using four cores for IDP traffic assignment, the use of MDP allowed two traffic assignments to run in parallel (thus, 8 cores would be in use, but only 4 in each of the two IDP sessions). COG/TPB staff incorporated these AECOM recommendations into Build 40 of the Version 2.3 Travel Model (Ver. 2.3.40), and these same parallelization enhancements, such as the use of both IDP and MDP, also exist in the Version 2.3.52 Travel Model and later models.

8.2.4 Implementation of parallelization in the Version 2.3.52 through 2.3.75 travel models

The Version 2.3.52 Travel Model (and later models, including Ver. 2.3.75) has three types of parallelization to help minimize run times:

- Cube Cluster intra-step distributed processing (IDP)
- Cube Cluster multi-step distributed processing (MDP)
- Windows operating system: Running programs in parallel using multiple concurrent command windows

IDP is used in three modeling steps:

- Highway assignment (*Highway_Assignment_Parallel.s*)
- Transit fare development (*MFARE2.S*)
- Transit assignment (*Combine_Tables_For_TrAssign_Parallel.s*)

By contrast, MDP is used for only one step: Highway assignment (*Highway_Assignment_Parallel.s*). In other words, **highway assignment uses both IDP and MDP**. The model is set up to use four cores in IDP, and, using MDP, there are two concurrent IDP sessions: A main node, which uses four cores via IDP, and a sub-node, which also uses four cores via IDP. **This combination of IDP and MDP means that highway assignment uses 8 cores concurrently for processing**.

Lastly, running programs in parallel by using multiple concurrent command windows is used for three modeling steps:

- Transit skimming (command windows invoked by *Transit_Skim_All_Modes_Parallel.bat*)
- Mode choice (command windows invoked by *Mode_Choice_Parallel.bat*)
- Transit assignment (command windows invoked by *Transit_Assignment_Parallel.bat*)

IDP, which works only for the MATRIX or HIGHWAY modules of Cube Voyager, is implemented in a Cube Voyager script using **a single line of code**, such as this from the *Highway_Assignment_Parallel.s* script:

```
distributeIntrastep processId='AM', ProcessList=%AMsubnode%
```

---

[62] For more details, see AECOM and Stump/Hausman Partnership, "FY 2012 Draft Final Report, COG Contract 12-006: Assistance with Development and Application of the National Capital Region Transportation Planning Board Travel Demand Model" (National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, July 13, 2012), chap. 5, http://www.mwcog.org/uploads/committee-documents/aV1dWVhb20120720132722.pdf.

By contrast, **MDP** is implemented in a Cube Voyager script using **an MDP block of code**. The code block begins and ends with code such as the following (from the *Highway_Assignment_Parallel.s* script):

```
DistributeMULTISTEP ProcessID='AM', ProcessNum=1
       (various lines of code)
ENDDistributeMULTISTEP
```

The IDP statement above can be used on its own or within an MDP block. Examples of both of these cases can be found in the *Highway_Assignment_Parallel.s* script.

Table 17 shows the five modeling steps where parallelization is used, noting the method of parallelization (e.g., IDP, MDP, or batch file); the names of the batch files that call each step; the names of the tokens (variables) used to store the number of processing nodes/subnodes to use for IDP/MDP; and the maximum number of simultaneous threads/cores used by the step. For example, in the case of transit skimming, parallelization is achieved by calling multiple simultaneous batch files. The batch file that actually initiates the multiple Windows command windows is *Transit_Skim_All_Modes_Parallel.bat*, and, since this step uses neither IDP nor MDP, there are no associated IDP or MDP tokens. The transit skimming process uses 4 cores. In the highway assignment step, both MDP and IDP are used. The tokens used for IDP are AMsubnode and MDsubnode (more on this later in this chapter). Although MDP is used, no tokens are used for MDP. Instead, the subnode for MDP is labeled using a fixed name, "AM1". The highway assignment step can use up to 8 simultaneous nodes/cores, since IDP is implemented with four cores and there are two concurrent IDP sessions, run using MDP. As can be seen in Table 17, modeling steps with parallelization use 4, 5, or 8 cores. Modeling steps without parallelization use only one core at a time.

8.2.4.1 Parallel processing in the "Run model"/wrapper batch file

This section of the report describes how the code in the "run model"/wrapper batch files affects parallel processing implemented in the Version 2.3.52 Travel Model (and used in subsequent versions of the model, such as Ver. 2.3.75). This section uses the 2019_final "run model" batch file (Figure 16 on page 59) as an example. It also describes changes that can be made to the "run model"/wrapper batch files in order run the model on a computer with fewer than the standard 8 cores. The next section of the report, 8.2.4.3 on page 85, describes how parallel processing (specifically IDP and MDP) has been implemented in one script: *Highway_Assignment_Parallel.s*. As noted in Table 17 (p. 81), the number of cores used in each of the parallelized modeling steps varies from 4 to 8 cores. Those steps that do not contain parallelization use only one core at a time. **Thus, to run the Version 2.3.52 Travel Model "out of the box," without making any changes, one needs a computer with eight or more cores**, as was explained in the section 3.1 of the report.

Table 17 Modeling steps where parallelization is used, including the maximum number of threads/cores used

Modeling Step	**First-Level "Child" Batch File**	**Second-Level "Child" Batch File**	**Method of Parallelization** (batch file or script which calls parallel process)	**Tokens Used for IDP****	**Max. No. of Cores**
Transit skimming	Transit_Skim_All_Modes_Parallel.bat	TransitSkim_LineHaul_Parallel.bat	**Batch file** (Transit_Skim_All_Modes_Parallel.bat)		4
Highway assignment	Highway_Assignment_Parallel.bat	None	**MDP** & **IDP** (Highway_Assignment_Parallel.s)	AMsubnode MDsubnode	8
Transit fare development	Transit_Fare.bat	None	**IDP** (MFARE2.s)	subnode	4
Mode choice	Mode_Choice_Parallel.bat	MC_purp.bat	**Batch file** (Mode_Choice_Parallel.bat)		5
Transit assignment	Transit_Assignment_Parallel.bat	TransitAssignment_LineHaul_Parallel.bat	**Batch file** (Transit_Assignment_Parallel.bat) **IDP** (Combine_Tables_For_TrAssign_Parallel.s)	subnode	4

** MDP as implemented in *Highway_Assignment_Parallel.s* does not use a token. Instead, the subnode name designation is done using a hard-coded value in the script, i.e., "AM1", as is explained later in this chapter.

The "run model"/wrapper batch file makes use of several of user-defined Windows environment variables. Those environment variables that do not deal with distributed processing were discussed in section 6.2.1 ("Description of the "run model"/wrapper batch file") on page 62. By contrast, those environment variables that do deal with distributed processing are discussed in this chapter (Chapter 8).

It is possible to have IDP-related or MDP-related statements in a script, but not use them. Consequently, one of the first Cube Cluster statements in any script that uses Cube Cluster will be a statement that indicates whether Cube Cluster should be used or not. An example of such a statement is shown below:

```
distribute intrastep=t multistep=f
```

The above statement indicates that IDP will be used (since its flag has been set to a value of TRUE or T) and MDP will not be used (since its flag has been set to a value of FALSE or F). In this example, even if there is code for MDP in the Cube Voyager script, the MDP processing will not be executed, since it has been set to FALSE. In our scripts and batch files, we generally use user-defined, Windows environment variables to set these two values. Thus, the statement above appears like this, using two "tokens" or variables to hold the true/false flags:

```
distribute intrastep=%useIdp% multistep=%useMdp%
```

In lines 13 and 14 of the "run model"/wrapper batch file (shown in Figure 16), these two "set" statements simply set the IDP and MDP usage flags to a value of TRUE:

```
set useIdp=t
set useMdp=t
```

The statement "distribute intrastep=%useIdp% multistep=%useMdp%" is used in both *Combine_Tables_For_TrAssign_Parallel.s* and *Highway_Assignment_Parallel.s*.[63] By contrast, in MFARE2.s, which uses IDP, but not MDP, the MDP flag has been hard-coded to FALSE, instead of using the token value set in the wrapper batch file: "distribute intrastep=%useIdp% multistep=f".

The "useidp" environment variable is used in the three steps shown in Table 17 that make use of IDP. As one would expect, the "usemdp" environment variable is used in the highway assignment step, since this step makes used of MDP. However, the "usemdp" environment variable **is also used in *Mode_Choice_Parallel.bat***. Specifically, if the "usemdp" flag is set to TRUE, then parallel processing is used in the mode choice step (via concurrent batch files, not MDP), which means that the five mode choice models (HBW, HBS, HBO, NHW, and NHO) are run in parallel command windows. If the "usemdp" flag is set to FALSE, then the mode choice process assumes that there is only one core available and runs the five mode choice models in sequence.

---

[63] This same statement is also currently found in the four transit skimming scripts (Transit_Skims_AB|BM|CR|MR.s), but it is no longer being used, so it should eventually be removed. At one point, we had used IDP in transit skimming, but, for the Ver. 2.3.40 model, when parallelization via concurrent batch files was added, the parallelization via IDP was dropped, so that the model would not use more than 8 concurrent cores.

The next two environment variables dealing with distributed processing can be found on in lines 16 and 17 of the "run model"/wrapper batch file (Figure 16):

```
set AMsubnode=1-4
set MDsubnode=2-4
```

As shown in Table 17, the AMsubnode and MDsubnode are used for IDP in traffic assignment. The names AMsubnode and MDsubnode would seem to indicate a subnode for processing the AM peak period and one for processing the midday period. Originally, when AECOM first proposed adding MDP to various steps of the model, it was added to both highway skimming and highway assignment. In highway skimming, there is a peak period skim, represented by the AM peak period, and an off-peak period skim, represented by the midday (MD) period. So, for skimming, the processing of the AM skims was sent off to a subnode, using MDP, and the AMsubnode variable/token was used to define the number of subnodes to use in IDP for the processing of the AM skims. And for the processing of the midday (MD) skims, this work was retained on the main processing node, with the MDsubnode variable/token used to define the number of subnodes to use in IDP for the processing of the MD skims.[64] For reasons of expediency, the same variable names (AMsubnode and MDsubnode) were used for the MDP in the highway assignment step. This meant that the AM peak period highway assignment was transferred, via MDP, to a subnode called "AM1." But, in the case of the PM traffic assignment, it was processed on the main node, but it used the "MD" token for naming its IDP subnodes.[65] What's more, the MD period was processed on branch/sub-node delineated "AM" (from the AMsubnode, not "MD") and the NT period was processed by the main node, but was delineated "MD" (from MDsubnode, not "NT"). When COG/TPB staff chose which of the AECOM suggested parallelization enhancements to implement, it chose not to implement MDP in the highway skimming, just in highway assignment.[66] The end result was that the naming convention used in the highway assignment step is somewhat confusing, even though, strictly speaking, the code functions normally. This is explained in more detail in the next section of the report. Consequently, given the way that MDP is used in only the highway assignment step, one could come up with better names for the two variables that are currently called AMsubnode and MDsubnode, as shown in Table 18.

Table 18 Current and alternate names for the two Windows environment variables that store information about the number of subnodes to use in IDP in the highway assignment

Current name of environment variable	Usage	Alternate name for environment variable
AMsubnode	Number of IDP subnodes used within an MDP block	idp_for_mdp_branch
MDsubnode	Number of IDP subnodes used w/in main processing branch	idp_for_main_branch

---

[64] See, for example, AECOM and Stump/Hausman Partnership, "FY 2012 Report," figs. 5–2.

[65] See, for example, AECOM and Stump/Hausman Partnership, figs. 5–6.

[66] See Mary Martchouk and Mark S. Moran to Ronald Milone, "Reducing Model Run Times: Results from the TPB Staff Tests of AECOM's Proposed Parallelization Enhancements to the Travel Model," Memorandum, September 17, 2012, 6.

Given that we generally have decided upon using four cores for IDP processing in the model (to maintain constistency), one might expect that AMsubnode = MDsubnode = 1-4. In other words, one might expect that we would provide Cube Cluster with a list of four nodes (1-4) for both the main branch of IDP processing and the MDP branch of IDP. According to AECOM, the reason for delineating only three subnodes (i.e., "MDsubnode=2-4") and not four, is that "only three slave threads [sub-nodes] are launched since the master uses itself as one of the threads to process the PM highway assignment."[67] Thus, despite the appearance of 3 nodes for MD and 4 nodes for AM, both IDP sessions use 4 nodes. To further clarify this issue, the IDP and MDP processes running in *Highway_Assignment_Parallel.s* have been diagramed in Figure 19 and Figure 20 in section 8.2.4.3.

8.2.4.2 Changing the "run model"/wrapper batch file for computers with fewer than 8 cores

The Version 2.3 Travel Model (Ver. 2.3.52 and later) is designed to run on a computer that has 8 or more cores. Table 19 shows the changes that a user should make in order to run the Version 2.3 model on computers with fewer than 8 cores. See section 8.2.2 ("Effect of Cube Cluster on modeled results") on p. 78 for a discussion about how modeled results can change slightly with the number of cores used.

Table 19 Running the Version 2.3 Travel Model on computers with fewer than 8 cores: Changes that need to be made to the "run model"/wrapper batch file

Number of cores in your computer	Changes needed in the "run model"/wrapper batch file	Result
8 or more	• No changes need be made	The model will run using between 1 and 8 cores, depending on the modeling step. Eight cores are used in highway assignment, due to the use of both IDP and MDP.
4	• Change "useMdp=t" to "useMdp=f"	This change will mean that highway assignment no longer uses MDP, only four cores with IDP. Also, in the mode choice model, sequential processing will be done (i.e., the five models will no longer run in parallel).
2	• Change "useMdp=t" to "useMdp=f" • Change "set AMsubnode=1-4" to "set AMsubnode=1-2" • Change "set MDsubnode=2-4" to "set MDsubnode=2"	This should result in only 2 cores being used in IDP.
1	• Change "useMdp=t" to "useMdp=f" • Change "useIdp=t" to "useIdp=f"	This will disable IDP and MDP and will also result in disabling the parallel processing in the mode choice step.

Note that the information in Table 19 is based on testing done by COG/TPB staff using a virtual computer with Cube 6.0.2 installed.

---

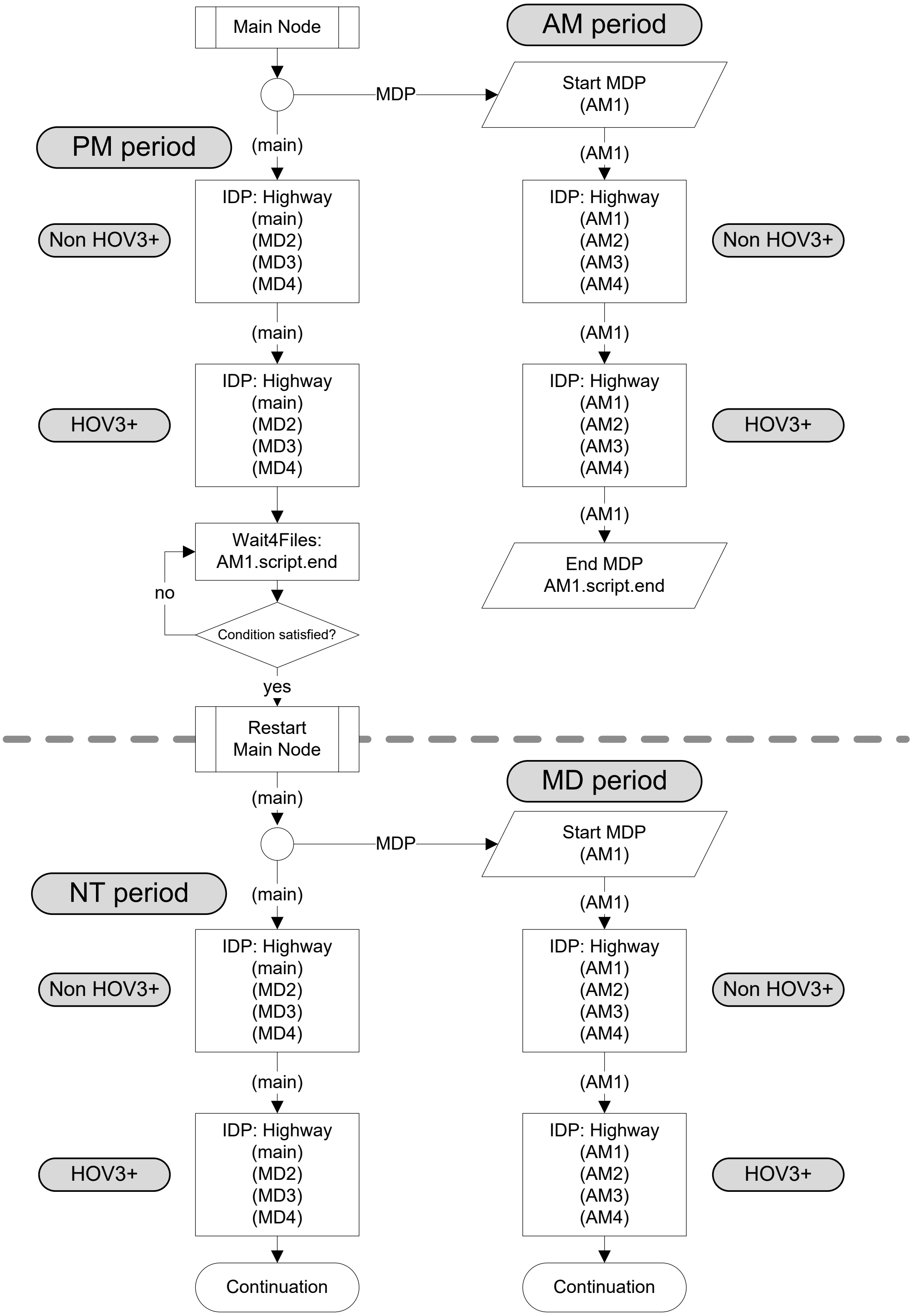
[67] AECOM and Stump/Hausman Partnership, "FY 2012 Report," 5–9 to 5–10.

8.2.4.3 Parallel processing in the highway assignment script

The previous section of the report, section 8.2.4.1, described how the code in the "run model"/wrapper batch files affects parallel processing implemented in the Version 2.3 Travel Model (Ver. 2.3.52 and later). This section of the report describes how parallel processing (specifically IDP and MDP) have been implemented in one script: *Highway_Assignment_Parallel.s*. Figure 19 shows a schematic of how IDP and MDP have been implemented in the highway assignment script. This figure shows the sub-node naming conventions that are used in the Version 2.3 Travel Model, keeping in mind some of the issues related to the naming of sub-nodes in section 8.2.4.1. Figure 20 is a revision of Figure 19, which shows a schematic of how IDP and MDP have been implanted in the highway assignment script, but with a proposal for more logical naming conventions (the changed sub-node names are indicated by using red font).

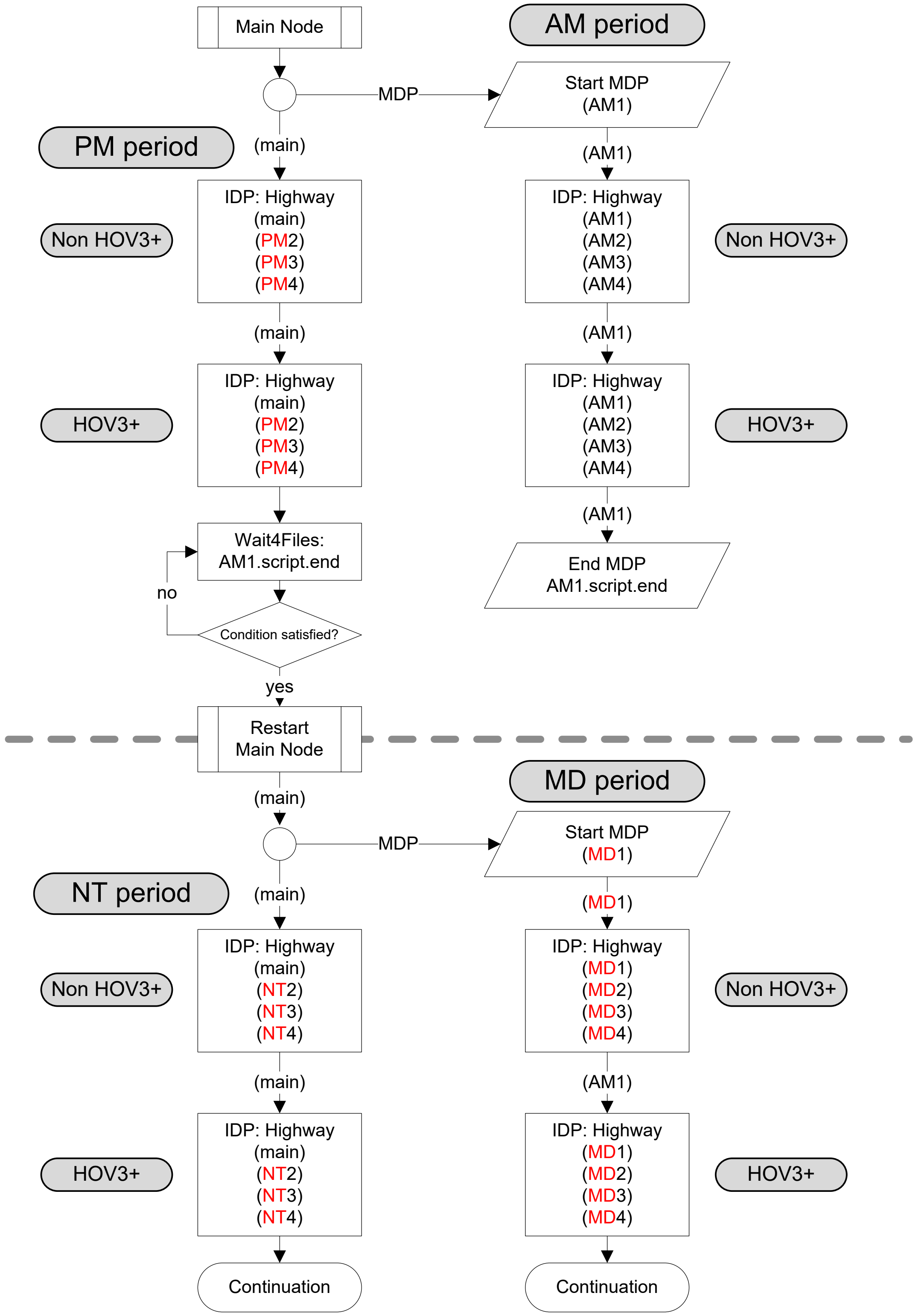
The actual highway assignment script relating to Figure 19 can be found in Appendix C (Volume 2). Since the script has over 2,000 lines of code, we have created an excerpt of the Highway_Assignment_Parallel.s script (about 150 lines), shown in Figure 21, that focuses on the lines that are most relevant to IDP and MDP. Locations where code has been removed are indicated in Figure 21 by a triple ampersand ("&&&"). On line 4 of Figure 21, the statement "distribute intrastep=%useIdp% multistep=%useMdp%" either turns IDP and MDP on or off, based on the value of the two tokens. The code in Figure 21 contains two MDP blocks. Each MDP block begins with the keyword "DistributeMULTISTEP" and ends with the keyword "ENDDistributeMULTISTEP." The beginning and ending of each of the two MDP blocks has been highlighted in green. IDP does not require a block of statements – it simply uses a single statement begun with the keyword "distributeIntrastep." Lines containing this keyword have been highlighted in yellow. For example, the first MDP block includes two IDP statements, but the next two IDP statements occur outside of an MDP block (in other words, they are run from the main node, not a sub-node). As shown in Figure 19, since we have two parallel streams of processes (e.g., one for the AM period and one for the PM period), we need to use a "Wait4Files" keyword, which ensures that the main line of processing stops until the MDP branch completes it work. The Wait4Files keywords have been highlighted in blue in Figure 21. So, as indicated in Figure 19, when the AM period processing is finished a file called AM1.script.end is generated. The Wait4Files tells the main line of processing to stop until it detects that the AM1.script.end file has been generated.

Figure 19 Schematic of IDP and MDP in the highway assignment process of the Ver. 2.3 Travel Model (*Highway_Assignment_Parallel.s*): Existing naming convention for nodes



Ref: ver2.3.52_hwy_assign_mdp_idp.vsd

Figure 20 Schematic of IDP and MDP in the highway assignment process of the Ver. 2.3 Travel Model (*Highway_Assignment_Parallel.s*): Proposed new naming convention for nodes (changes shown in red)



Ref: ver2.3.52_hwy_assign_mdp_idp.vsd

Figure 21 Excerpts from the *Highway_Assignment_Parallel.s* script (triple ampersand => code removed)

```
&&&
/*  **** Set up tokens in Voyager Pilot step ***** */
;  useIdp = t (true) or f (false);  this is set in the wrapper batch file
distribute intrastep=%useIdp% multistep=%useMdp%
&&&
;;;*****************************************************************************
;;; Step 1: Execute peak-period traffic assignments (AM & PM)
;;;         AM nonHOV, HOV and PM nonHOV and HOV Assignemnts
;;;*****************************************************************************

itr = '%_iter_%'   ;;
&&&
INPNET = 'ZONEHWY.NET'

DistributeMULTISTEP ProcessID='AM', ProcessNum=1

PRD    =  'AM'         ;
PCTADT =   41.7        ; %_AMPF_%  AM PHF (% of traffic in pk hr of period)
CAPFAC=1/(PCTADT/100)     ;  Capacity Factor = 1/(PCTADT/100)
&&&
in_capSpd = '..\support\hwy_assign_capSpeedLookup.s'         ;;     FT x AT Speed & Capacity lookup
VDF_File  = '..\support\hwy_assign_Conical_VDF.s'            ;;     Volume Delay Functions file

;;;*****************************************************************************
;;; Step 1.1: Assign AM NonHOV3+ trip tables only
;;;           (SOV, HOV2, CV, TRUCK & AIRPORT PASSENGER TRIPS)
;;;*****************************************************************************

  RUN PGM=HIGHWAY  ; NonHOV3+ traffic assignment
distributeIntrastep processId='AM', ProcessList=%AMsubnode%
  FILEI NETI     =  @INPNET@                          ; TP+ Network
&&&
ENDRUN
;;;*****************************************************************************
;;; Step 1.2: Assign AM HOV3+ only
;;;*****************************************************************************

  RUN PGM=HIGHWAY  ; HOV3+    traffic assignment
distributeIntrastep processId='AM', ProcessList=%AMsubnode%
  FILEI NETI     = TEMP1_@PRD@.NET                    ; TP+ Network
&&&
ENDRUN
ENDDistributeMULTISTEP

PRD    =  'PM'         ;
PCTADT =   29.4        ; %_AMPF_%  AM PHF (% of traffic in pk hr of period)

&&&
;;;*****************************************************************************
;;; Step 1.3: Assign PM NonHOV3+ trip tables only
;;;           (SOV, HOV2, CV, TRUCK & AIRPORT PASSENGER TRIPS)
;;;*****************************************************************************

  RUN PGM=HIGHWAY  ; NonHOV3+ traffic assignment
distributeIntrastep processId='MD', ProcessList=%MDsubnode%
  FILEI NETI     =  @INPNET@                          ; TP+ Network
&&&
ENDRUN
;;;*****************************************************************************
;;; Step 1.4: Assign PM HOV3+ only
;;;*****************************************************************************

  RUN PGM=HIGHWAY  ; HOV3+    traffic assignment
```

```
distributeIntrastep processId='MD', ProcessList=%MDsubnode%
  FILEI NETI     = TEMP1_@PRD@.NET                    ; TP+ Network
&&&
ENDRUN

Wait4Files Files=AM1.script.end, CheckReturnCode=T, PrintFiles=Merge, DelDistribFiles=T

;;;*****************************************************************************
;;; Step 2: Execute off-peak-period traffic assignments (midday/MD & night/NT)
;;;         All 6 trip tables are assigned together.
;;;*****************************************************************************

DistributeMULTISTEP ProcessID='AM', ProcessNum=1
            ; Off-Peak Period
PRD    =  'MD'          ;
PCTADT =   17.7         ; %_MDPF_%  Midday PHF (% of traffic in pk hr of period)
CAPFAC=1/(PCTADT/100)                  ; Capacity Factor = 1/(PCTADT/100)
; Turnpen  = 'inputs\turnpen.pen'        ; Turn penalty

  RUN PGM=HIGHWAY  ; Off-peak (midday & evening) traffic assignment
distributeIntrastep processId='AM', ProcessList=%AMsubnode%
FILEI NETI     = @INPNET@                          ; TP+ Network
&&&
ENDRUN

ENDDistributeMULTISTEP

PRD    =  'NT'          ;
PCTADT =   15.0         ; %_NTPF_%  NT PHF (% of traffic in pk hr of period)
CAPFAC=1/(PCTADT/100)                  ; Capacity Factor = 1/(PCTADT/100)

  RUN PGM=HIGHWAY  ; Off-peak (midday & evening) traffic assignment
distributeIntrastep processId='MD', ProcessList=%MDsubnode%
FILEI NETI     = @INPNET@                          ; TP+ Network
&&&
ENDRUN

Wait4Files Files=AM1.script.end, CheckReturnCode=T, PrintFiles=Merge, DelDistribFiles=T

; END OF MIDDAY and OFF PEAK ASSIGNMENT

;;;*****************************************************************************
;;; Step 3: Calculate restrained final Volumes, speeds, V/Cs (No MSA)
;;;*****************************************************************************
;;; Step 3.1: Loop thru 1 (AM) and 2 (PM)
;;;*****************************************************************************

LOOP PERIOD = 1,2  ; Loop thru 1 (AM) and 2 (PM);  Each pk per. includes NonHOV3+ and HOV3+

IF (PERIOD==1)
            PRD    =  'AM'          ;
            PCTADT =   41.7         ;
ELSE
            PRD    =  'PM'          ;
            PCTADT =   29.4         ;
ENDIF
CAPFAC=1/(PCTADT/100)      ; Capacity Factor = 1/(PCTADT/100)

  RUN PGM=HWYNET                  ; Calculate restrained speed/perform MSA volume averaging
&&&
ENDRUN
ENDLOOP            ; Loop thru 1 (AM) and 2 (PM);  Each pk per. includes NonHOV3+ and HOV3+

;;;*****************************************************************************
;;; Step 3.2: Loop thru 3 (MD) and 4 (OP)
;;;*****************************************************************************

LOOP PERIOD = 3,4  ; Loop thru 1 (midday, MD) and 2 (evening/off-peak, OP)
```

```
132  IF (PERIOD==3)
133              PRD    =  'MD'         ;
134              PCTADT =   17.7
135  ELSE
136              PRD    =  'NT'         ;
137              PCTADT =   15.0
138  ENDIF
139  CAPFAC=1/(PCTADT/100)      ; Capacity Factor = 1/(PCTADT/100)
140
141    RUN PGM=HWYNET   ; Calculate restrained speed/perform MSA volume averaging
142  &&&
143  ENDRUN
144  ENDLOOP            ; Loop thru 1 (midday, MD) and 2 (evening/off-peak, OP)
145
146  ;;;*****************************************************************************
147  ;;; Step 4: Summarize 24-hour VMT of current AM, PM, MD & NT assignments
148  ;;;*****************************************************************************
149
150  RUN PGM=HWYNET     ; Summarize 24-hour VMT of current AM, PM, MD & OP assignments
151  &&&
152  ENDRUN
```

Ref: Highway_Assignment_Parallel_excerpt2.s

To conclude the discussion of Figure 21, we note here some cases where process sub-nodes have somewhat misleading names. The four periods being processed are AM, PM, MD, and NT, and these are indicated in Figure 21 by pink/purple highlighting. For the AM assignment, there are no issues with misleading names for the sub-nodes. For example, we can see that on line 17, the AM processing starts, and the four IDP sub-nodes for the non-HOV3+ assignment are named AM1, AM2, AM3, and AM4 (line 30 of Figure 21), since %AMsubnode% equals "1-4". After the non-HOV3+ assignment is complete, then HOV3+ assignment occurs, and the four IDP sub-nodes for the HOV assignment are also named AM1, AM2, AM3, and AM4 (line 39 of Figure 21). The mislabeled naming of sub-nodes begins with the PM period assignment, which begins on line 45. For example, for the PM non-HOV3+ assignment, the sub-nodes are named MD2, MD3, and MD4 (line 55 of Figure 21), since %MDsubnode% equals "2-4". It would be less confusing if these sub-nodes had been named PM2, PM3, and PM4. The same misleading naming convention is used for the sub-node names in the PM HOV3+ assignment: MD2, MD3, and MD4 -- instead of PM2, PM3, and PM4 (line 64 of Figure 21). A similar issue occurs for the midday assignment (beginning on line 78 of Figure 21) and the nighttime assignment (beginning on line 91 of Figure 21). **At any rate, it should be noted that the code works correctly, despite the misleadingly named sub-nodes**. In a future version of the model, it is possible that we will clean up the sub-node naming.

9 Debugging cases where the model run stops prematurely or crashes

If a model run stops prematurely or crashes, one can use the "full output" text file to determine:

- The speed feedback iteration (e.g., pump prime, iteration 1, …, iteration 4) that was underway when the model stopped
- The modeling step, within a given speed feedback iteration, that was underway when the model stopped (e.g., network building, trip distribution, mode choice, traffic assignment).
- Possible error messages returned by any programs that crash.

An excerpt from one of the "full output" text files can be seen in Figure 22. Additionally, when debugging a model run crash, one should find the latest print file (*.prn) to see any relevant error or warning messages. One can search this file using regular expressions to find any warnings or errors.[68]

In some cases, it is sufficient to review the "full output" text file and the latest print file to determine why a model run stops. As an additional tool, however, one can also scan the "search for errors" text file (e.g. 2019_Final_searchForErrs.txt), which is created by the *searchForErrs.bat* batch file. An example of the "search for errors" text file can be found in Figure 23.

One of the most common causes for a model run crash is a sharing violation, which typically occurs when one launches two or more concurrent model runs in the same root directory at about the same time. **One way to protect against this happening is to ensure there is a time delay (ca. 1 hour) between the start of two model runs that share the same root directory**. Additionally, there is now a second reason to offset model runs by about an hour: As described in Chapter 11 ("Building transit walksheds and calculating zonal walk percent"), with the new process for generating transit walksheds and calculating the percent of each zone within walking distance to transit, it is imperative to use a 45- to 60-minute gap in the start times of two or more model runs on the same computer.

---

[68] For example, using the text editor PSPad, one can use this regular expression (regex) to find warnings or errors: F\([0-9]*\):|W\([0-9]*\):

Figure 22 An excerpt from an example of the “full output” text file that is created during a model run

```
F:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal>set _year_=2019

F:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal>set _alt_=Ver2.3.75_2019_Final

F:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal>set _maxUeIter_=1000

F:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal>set _tcpath_=

F:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal>rem ====== Pump Prime Iteration
==========================================

F:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal>set _iter_=pp

F:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal>set _prev_=pp

F:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal>set _relGap_=0.01

F:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal>call ArcPy_Walkshed_Process.bat 2019_Final
    Searching for Python in Path C:\Python27\ArcGIS10.5
    Searching for Python in Path C:\Python27\ArcGIS10.4
    Searching for Python in Path C:\Python27\ArcGIS10.3
    Found Python in Path C:\Python27\ArcGIS10.3

 Using Python from Directory = C:\Python27\ArcGIS10.3



1) Creating Subdirectories ...


2) Preparing Inputs ...

    using TRNBUILD line files

3) Launching ArcPy-based Walkshed Process ...
```

Ref: Z:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal\2019_Final\2019_Final_fulloutput.txt

Figure 23 An excerpt from the “search for errors” file that is created during a model run

```
********** Searching for errors and anomalies after a travel model run **********
Program name: searchForErrs.bat

***** Searching *fulloutput.txt

  *** Searching for cases where a file could not be found


***** Searching report files (*.rpt)
  *** Searching for evidence that TP+ (TPMAIN) is running, instead of Voyager (PILOT)
  *** Searching for evidence of LINKO nodes that do not have XY values
2019_Final\i1_TRANSIT_SKIMS_AB.RPT:W(693): The following LINKO nodes do not have XY values:
2019_Final\i1_TRANSIT_SKIMS_AB.RPT:W(693): The following LINKO nodes do not have XY values:
2019_Final\i1_TRANSIT_SKIMS_AB.RPT:W(693): The following LINKO nodes do not have XY values:
2019_Final\i1_TRANSIT_SKIMS_AB.RPT:W(693): The following LINKO nodes do not have XY values:
2019_Final\i1_TRANSIT_SKIMS_AB.RPT:W(693): The following LINKO nodes do not have XY values:
```

Ref: Z:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal\2019_Final\2019_Final_searchForErrs.txt

10 Known issues related to running the model

10.1 Cube Cluster differences

When using Cube Cluster, the estimated VMT coming from the model can change slightly, depending on how many cores/nodes are used. See section 8.2.2 ("Effect of Cube Cluster on modeled results") on page 78 for more details.

10.2 Model run stops before finishing

We have experienced some cases where a model run will prematurely stop (this is sometimes also referred to as a "crash") for no apparent reason. Sometimes the exact same model run will complete successfully if run on a different computer. While we are still trying to determine the cause of these stoppages, we do, however, have a pragmatic way for dealing with these events. Determine where the model run crashed. Re-launch the model run but comment out all the steps in the "run model steps" that have completed successfully, so that the model runs only the step that crashed and the steps that follow it. This procedure will typically result in a normal model run, even though it requires the analyst to intervene midstream. Please see Chapter 9 ("Debugging cases where the model run stops prematurely or crashes") on page 91.

10.3 Issues with traffic assignment convergence

In the past, we have identified some cases where the gap (but not relative gap) for a given user equilibrium iteration in traffic assignment is equal to exactly zero, as opposed to a small, but non-zero value. We have reported this issue to Citilabs, which began an investigation into the matter. However, since the Version 2.3.75 model (like its predecessors, e.g., 2.3.57 - 2.3.70) uses the *relative* gap and the number of user equilibrium iterations as stopping criteria, this issue should not affect the running of the model. Nonetheless, a model user could experience convergence issues if they change the model to use a tight stopping criterion. For example, in one test conducted by TPB staff, a stopping criterion of 10^{-6} was used, but the traffic assignment continued, going past 10^{-7}, even though 10^{-6} was specified. This happened for a for a future-year scenario that had variably-priced facilities. At this point, we do not have any definitive answers, but we contacted Citilabs, whose staff thought that the difficulty reaching convergence was due to large toll values that dominate the link-cost function. Again, this should not be an issue for standard runs of the travel model, which use progressively tightening relative gap tolerances of 10^{-2}, 10^{-3}, and 10^{-4}.

10.4 Running multiple concurrent model runs on one computer/server

A user may wish to run two or more travel model runs on one computer or server at the same time. To compute the maximum number of concurrent model runs that may be run on a given computer, divide the number of cores (real or virtual, whichever is greater) by the number of cores needed per model run (currently 8, in the traffic assignment step). For example, on a computer like COG's travel model server #6 (tms6), which has 16 physical cores or 32 virtual cores due to Intel's Hyper-Threading Technology, the calculation would be:

(32 virtual cores)/(8 cores needed per model run) = 4 concurrent model runs (maximum)

However, based on our experience at COG, the actual number of concurrent model runs that you can run on a given computer may be less than the maximum number, depending on factors such as the following:

- The number of users launching the model runs: **This no longer appears to be an issue**. In the past, using Cube 6.1 SP1, we had found that, if two or more users tried to launch concurrent model runs, even if it was only two users, each with one model run, one of the two model runs would often stop prematurely or crash. However, **under Cube 6.4.1, we found that two or three users can submit concurrent model runs**.[69]
- Whether one runs the automated ArcPy walkshed process: This is now turned off by default in the model transmittal package, but it can also be uncommented (turned on) by the user if the user is making changes to the transit network and wants to recompute the transit walksheds and their resultant walk percentages.
- Whether one introduces a time delay (lag time) between model runs: For example, **two model runs can be launched at the same time**, or the **modeler can choose to offset the two launch times by a certain amount of time**. Thus, "**concurrent**" can mean that all the runs were started at the same time or that there was some offset between the start times of the model runs.

Finally, as noted in Section 3.3, based on recent communications with Citilabs (personal communication, 2/6/17), it is better not to overload the processor, so, although a 32-core computer should be able to run 4 concurrent model runs (4 x 8 = 32), it would be better to limit this computer to 3 concurrent model runs. Citilabs alludes to this issue in recent documentation: "However, when comparing two processors from the same family, assuming the processors are otherwise identical, an 8-core processor without Hyper-Threading will outperform a 4-core processor with Hyper-Threading, even though both processors are making 8 threads available to the operating system."[70]

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[69] Ngo to Moran et al., "Testing the COG/TPB Travel Model Servers: 1) Need for Admin Privileges; 2) Ability to Run Two or More Concurrent Model Runs by Two or More Users; 3) Experience with Malware," 5.

[70] Citilabs, Inc., "Cube Base Reference Guide, Version 6.4.1," 10–11.

11 Building transit walksheds and calculating zonal walk percentages

11.1 Overview

One of the inputs to the travel demand model is the percentage of each zone that is within walking distance to transit. Conceptually, one develops a series of transit walksheds, which are then combined geographically with zone boundaries to calculate the percentage of each zone that is within walking distance to transit. This procedure creates point buffers around transit stop nodes and then overlays these point buffers with TAZ boundaries. The process is made more complicated by the fact that two walking distances are differentiated: a short walk (0.5 miles) and a long walk (1.0 miles). See Section 21.4.3 ("Market segmentation by access to transit") beginning on p. 167 for more details.

The model assumes that the area of each TAZ that is within a short-walk or a long-walk to transit is stored in a text file (areawalk.txt). This file is used by the walk access script (*walkacc.s*) to calculate the zonal walk *percentages*, which are then stored in a second text file (NLWalkPCT.txt).[71] This second file is then an input to both the transit fare process (*prefarv23.s*) and the mode choice process.

Note: **For the associated Ver. 2.3.75 model transmittal package, the automated transit walkshed process has been turned off** (commented out in the run_modelSteps batch files). This is because:

1. If the user is not changing the transit network, there is no need to rerun this process, since we supply the needed areawalk.txt file with each network scenario;
2. Based on experience, this step is one of the most likely modeling steps to cause a premature stop or a crash, so for most users, it is better simply not to run it automatically. The reasons why the automated transit walkshed process causes a premature stop or a crash are varied, from incompatibilities between Cube Base and ArcGIS (see Table 20 on p. 98), to issues related to the way that the current ArcGIS engine runtime deals with slivers in the buffering process.

11.2 Application Details

The Ver. 2.3.57 travel model continues using an automated/integrated transit walkshed process, which was developed by AECOM. The process is automated in the sense that it is run using a Python/ArcPy script, so it does not require manual intervention from the user. The process is integrated in the sense that it is built into the travel model run: It is now the first step in the "run model steps" batch file ("call *ArcPy_Walkshed_Process.bat* %1"). The new process was developed by AECOM in FY 2014, and is discussed both in AECOM's FY 2014 report.[72] Although this process is turned off, by default, in the version of the model distributed with the model transmittal package, for users who would like to run the

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[71] See the modeling flowchart in Appendix A.

[72] AECOM, "FY 2014 Final Report, COG Contract 12-006: Assistance with Development and Application of the National Capital Region Transportation Planning Board Travel Demand Model" (National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, August 18, 2014), chap. 3, http://www.mwcog.org/uploads/committee-documents/Y11YWFZd20140922110646.pdf.

process (perhaps because they have made a change to a transit network), the user can simply uncomment (remove the "REM") the following line in the run_modelSteps batch file:

```
call ArcPy_Walkshed_Process.bat %1
```

As noted by AECOM, "ArcPy was chosen as the basis for development because it provides convenient and powerful access to the GIS functionalities in a (Python) programming environment that is transparent and relatively easy to modify."[73] Another advantage of the new process is that it does not require one to have/purchase ArcGIS. One needs only to have purchased Cube, which comes with the ArcGIS engine runtime and which is already a requirement to run the model. To run the new integrated walkshed process, one must have the following:

- One of the following two ArcGIS software packages:
  - ArcGIS, version 10.1: Available for purchase from Esri. Some modelers may already have this software; some may not.
  - ArcGIS engine runtime, version 10.3: Available for free, if you have purchased Cube. All modelers will have purchased Cube, since it is needed to run the model. Cube version 6.4.1 comes with ArcGIS engine runtime 10.3.4959. If you do not have a full installation of ArcGIS 10.1, you will want to install Cube, including the ArcGIS engine runtime.
- Python: This is free, open-source software. One way to get it automatically is to install Cube "with ArcGIS engine runtime." It may also be included when one installs the full version of ArcGIS.

Notes:

1. As of Ver. 2.3.66, the areawalk.txt file created in the new automated walkshed process is sorted by TAZ.
2. In testing, if two model runs that incorporate the new transit walkshed process were started at the same time, one of the two runs will likely stop prematurely in the walkshed process. This is likely due to a license restriction with the ArcGIS runtime engine. Consequently, it is recommended that multiple model runs with enabled walkshed process on the same computer not be launched at the same time. Instead, **it is recommended that the start times be staggered/offset by 45 to 60 minutes**.[74] Based on a series of recent "stress tests" to see how many concurrent model runs could be completed on one server, it was also found that the 45-60-minute time offset is useful for minimizing the chance of a model run crash (irrespective of whether the new walkshed process is run, since a sharing violation can occur with other modeling steps).

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[73] AECOM, 3–2.

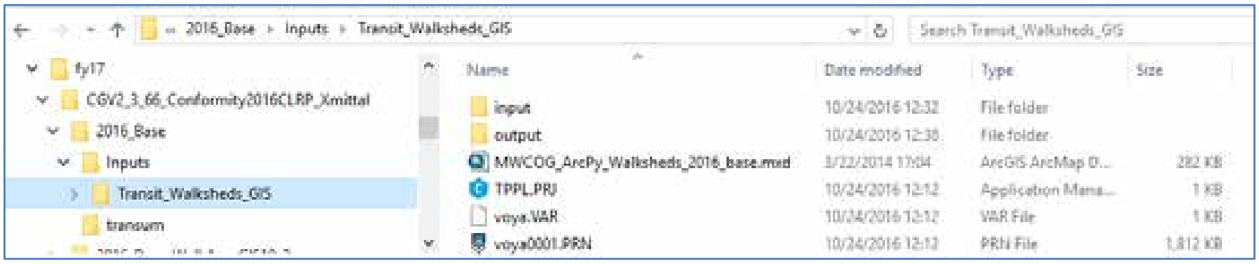
[74] AECOM, 3–8.

The new walkshed process appears to give identical results to the previous walkshed process, providing the inputs, such as the transit line files, are identical and correctly coded.[75]

In the model transmittal package, this line has been turned off (commented out), by placing “REM” at the beginning of the line (for the reasons explained earlier in this section).

If this automated transit walkshed process is run, this step occurs at the start of the pump-prime (PP) speed feedback loop. Once the walkshed process has been run, a new folder will be created in the “inputs” folder, named “Transit_Walkshed_GIS,” as shown in Figure 24. Within this folder, one can find an ArcGIS map document file (MWCOG_ArcPy_Walksheds_*.mxd) which can be used to visualize the walkshed buffers, as shown in Figure 25.

Figure 24 Folder structure for the automated ArcPy walkshed process



Name	Date modified	Type	Size
input	10/24/2016 12:32	File folder	
output	10/24/2016 12:38	File folder	
MWCOG_ArcPy_Walksheds_2016_base.mxd	3/22/2014 17:04	ArcGIS ArcMap D...	282 KB
TPPL.PRJ	10/24/2016 12:12	Application Mana...	1 KB
voya.VAR	10/24/2016 12:12	VAR File	1 KB
voya0001.PRN	10/24/2016 12:12	PRN File	1,812 KB

Note that the Transit_Walkshed_GIS folder includes two subfolders, “input” and “output”, which should not be confused with the “inputs” folder that is stored within the scenario-specific folder (which, in this case is called 2019_Final). The ArcPy walkshed process creates two files: areawalk.txt and PercentWalk.txt, but only the first file is used by the travel model. If a copy of areawalk.txt already exists in the “inputs” folder, the old copy will be renamed as AreaWalk_Old.txt, before the new areawalk.txt file is created.[76]

11.3 Known issues

Although the new automated transit walkshed generation process has been a benefit to most users of the regional travel model, it has also been the source of many technical assistance calls to the COG/TPB staff when the process crashes for one reason or another. To minimize the likelihood that the automated ArcPy transit walkshed process will crash, we recommend you use versions of Cube and ArcGIS that are compatible. Table 20 shows which versions of Cube Base are **compatible** with ArcGIS, **in terms of the ability to run the automated transit walkshed process**. We have tested four different versions of ArcGIS with Cube Base ver. 6.4.1. Two of these worked (ArcGIS Engine Runtime 10.3 and ArcGIS 10.1) and two of these did not (ArcGIS 10.3.1 and ArcGIS 10.4.1). According to recent Citilabs documentation covering Cube 6.4.2 and 6.4.1, “Cube 6.4.1 includes support for ArcGIS versions 9.3 to

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[75] See page 2-3 of Mark S. Moran and Dzung Ngo to David Roden and Krishna Patnam, “Comments on Your Cube/ArcPy-Based Transit Walkshed Process and Its Associated Memo Dated March 25, 2013,” Memorandum, May 15, 2014.

[76] AECOM, “FY 2014 Final Report, COG Contract 12-006: Assistance with Development and Application of the National Capital Region Transportation Planning Board Travel Demand Model,” 9–2.

10.3.1."[77] However, in our test #3, we found that the "support" was not such that it would allow the automated ArcPy transit walkshed process to run to completion, which is why we have noted that Cube Base 6.4.1 and ArcGIS 10.3.1 are not compatible for running the ArcPy automated walkshed process.

The table also shows two other cases, both for Cube 6.4.2. In test #5, an external user tried using Cube 6.4.2 and ArcGIS 10.4, but the two software packages were incompatible. In test #6, COG/TPB staff tested Cube 6.4.2 with ArcGIS engine runtime 10.4. In this case, the two software packages seemed to be compatible, but, as noted in a footnote to the table below, Cube Voyager ver. 6.4.2 appears to be less stable than Cube 6.4.1 when running the automated ArcPy transit walkshed process. TPB staff experienced several crashes in the ArcPy walkshed process under Cube 6.4.2. When staff upgraded Cube 6.4.1 to Cube 6.4.2 but did not upgrade ArcGIS Engine Runtime from 10.3.4959 to 10.4.1636776 (test #7), the model runs did not crash. The success of test #7 indicates the instability of ArcGIS Engine Runtime 10.4.1636776 coming with Cube 6.4.2 when running the automated transit walkshed process.

Staff recommend using Cube 6.4.1 and its ArcGIS Engine Runtime, Version 10.3.4959, as is shown in **bold** in Table 20.

Table 20 Compatibility between Cube Base and ArcGIS, in terms of the ability to run the automated transit walkshed process

Version of Cube Base	Version of ArcGIS	Compatible? *	Test Conducted by	Test No.
6.4.1	**10.3.4959 (ArcGIS Engine Runtime**)**	**Yes**	**COG/TPB**	**1**
	10.1 (full version)	Yes	COG/TPB	2
	10.3.1 (full version)	No	COG/TPB	3
	10.4.1 (full version)	No	COG/TPB	4
6.4.2***	10.4 (full version)	No	No. Va. Transportation Commission	5
	10.4.1636776 (ArcGIS Engine Runtime**)	Unstable	COG/TPB	6
	10.3.4959 (ArcGIS Engine Runtime****)	Yes	COG/TPB	7

* "Compatible" means that the tester was able to run the automated ArcPy transit walkshed process using the noted version of Cube and ArcGIS.

** ArcGIS Engine Runtime comes with Cube.

*** Compared to Cube Voyager ver. 6.4.1, Cube Voyager ver. 6.4.2 appears to be less stable when running the automated ArcPy transit walkshed process (TPB staff experienced several crashes in the ArcPy walkshed process under Cube 6.4.2).

**** ArcGIS Engine Runtime coming with Cube 6.4.1 is kept when updating to Cube 6.4.2.

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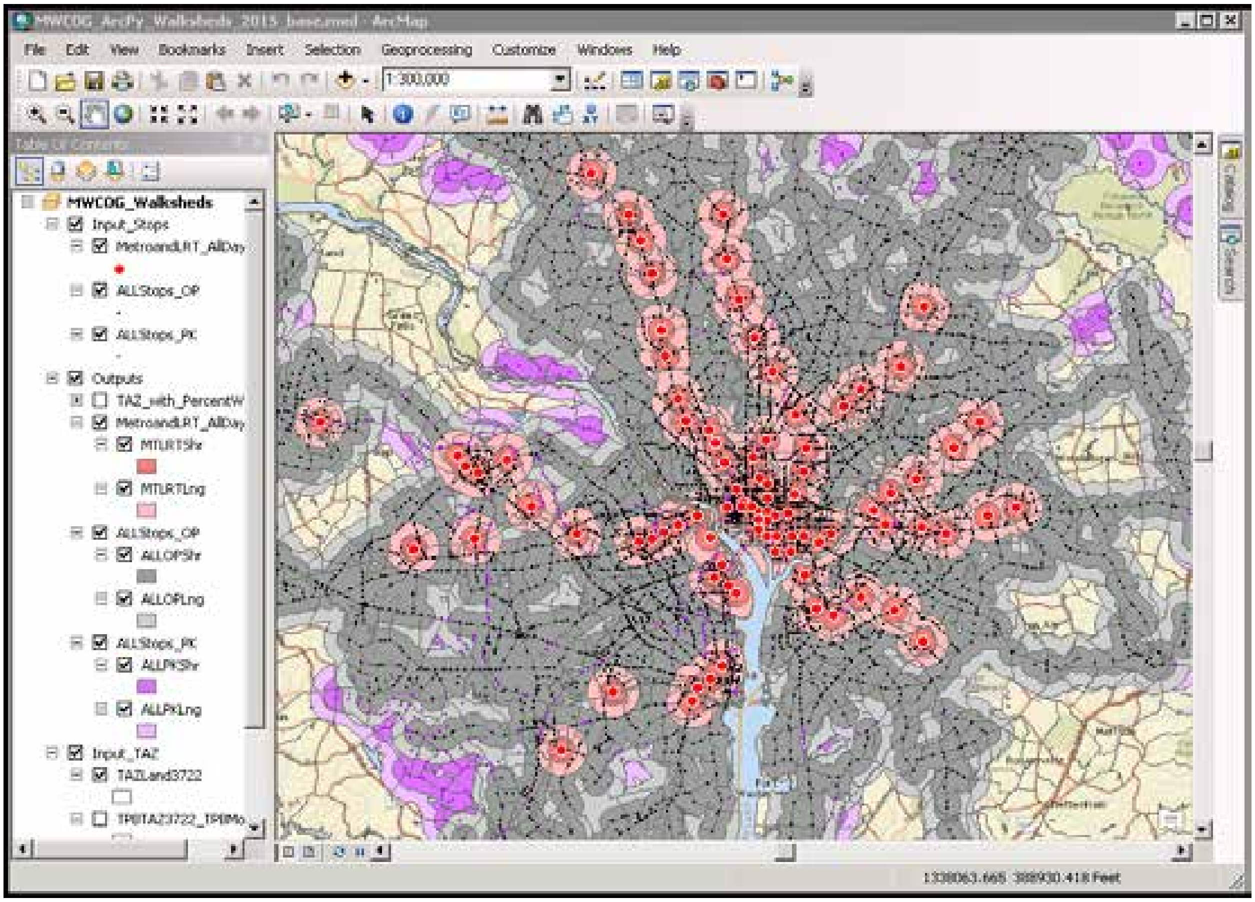
[77] Citilabs, Inc., "Cube Base Release Summary, Version 6.4.2" (Tallahassee, Florida: Citilabs, Inc., September 22, 2016), 4, http://citilabs-website-resources.s3.amazonaws.com/resources/RS_CubeBase.pdf.

Figure 25 Walkshed buffers for a typical base-year scenario



12 Set-Up Programs and Highway Network Building

12.1 Overview

Following the generation of transit walksheds, the initial modeling steps of the Version 2.3 model are executed to establish basic modeling parameters to construct a binary (or "built") highway network. The steps are executed using two batch files:

- *Set_CPI.bat*: The batch file calls two Cube Voyager scripts, *Set_CPI.s* and *Set_Factors.s*
- *PP_Highway_Build.bat*: The batch file calls two Cube Voyager scripts, *AreaType_File.s* and *V2.3_Highway_Build.s*

The modeling steps included in these two batch files are shown on pages A-2 and A-3 of the flowchart in *Appendix A*. *Set_CPI.s* is used to establish deflation factors that are used in subsequent toll-related and transit fare-related steps. *Set_Factors.s* is used to establish K-Factors used in trip distribution and is also used to create the file *station_names.dbf* (used for the transit assignment summary process), which is developed using information pulled from station.dbf. The *Area_Type.s* step establishes zonal area type codes based on land activity densities (see Table 31). The resulting area type file is subsequently used in the highway building step, *V2.3_Highway_Build.s*. These steps are not implemented within the speed feedback loop of the travel model; they are executed only once, in the "pump prime" stage of the travel model. The principal inputs to above modeling steps are listed in Table 21 and detailed in Table 22 through Table 26. The principal outputs are listed in Table 27, and are detailed in Table 28 and Table 29.

Table 21 Inputs to the set-up and highway network building process

File description	File name and location	Format
CPI schedule and parameter file	\Inputs\CPI_File.txt	Text
Zonal land use file	\Inputs\ZONE.DBF	DBF
Node coordinate file	\Inputs\NODE.DBF	DBF
Zonal area type override file	\Inputs\AT_override.txt	Text
Link file	\Inputs\LINK.DBF	DBF
Initial AM and midday hwy. speed lookup files	\Support\AM_SPD_LKP.TXT, \Support\MD_SPD_LKP.TXT	Text
Toll parameter file	\Inputs\Toll_Esc.dbf	DBF

Table 22 Land Use File Format Description (zone.dbf)

Variable name	Description
TAZ	TAZ (1-3722)
HH	Households
HHPOP	Household population
GQPOP	Group quarters population
TOTPOP	Total population
TOTEMP	Total employment

Variable name	**Description**
INDEMP	Industrial employment
RETEMP	Retail employment
OFFEMP	Office employment
OTHEMP	Other employment
JURCODE	Jurisdiction Code (0-23) *0/dc, 1/mtg, 2/pg, 3/alr/, 4/alx,5, ffx, 6/ldn, 7/ pw, 8/(unused), 9/ frd, 10/how, 11/aa, 12/chs, 13/(unused), 14/car, 15/cal, 16/stm, 17/ kg, 18/fbg, 19/stf, 20/spts, 21/fau, 22/clk, 23/jef*
LANDAREA	Gross land area (square miles)
HHINCIDX	Ratio of zonal HH median income to regional median HH income in tenths (i.e., 10 = 1.0) per the 2007 ACS
ADISTTOX	Airline distance to the nearest external station (whole miles)
TAZXCRD	TAZ X-coordinate (NAD83, whole feet)
TAZYCRD	TAZ Y-coordinate (NAD83, whole feet)

Table 23 Node Coordinate File Format Description (node.dbf)

Variable name	**Description**
N	Highway node number
X	X-coordinate (NAD83, whole feet)
Y	Y-coordinate (NAD83, whole feet)

Table 24 Base Highway Link File Format Description (link.dbf)

File Name	**Variable Name**	**Description**
Link.dbf	A	A-Node
	B	B_Node
	DISTANCE	Link distance (in 1/100ths of miles)
	JUR	Jurisdiction Code (0-23) *0/dc, 1/mtg, 2/pg, 3/alr/, 4/alx,5, ffx, 6/ldn, 7/ pw, 8/(unused), 9/ frd, 10/how, 11/aa, 12/chs, 13/(unused), 14/car, 15/cal, 16/stm, 17/ kg, 18/fbg, 19/stf, 20/spts, 21/fau, 22/clk, 23/jef*
	SCREEN	Screenline Code
	FTYPE	Link Facility Type Code (0-6)
		0/centroids, 1/Freeways, 2/Major Art., 3/Minor Art, 4/Collector, 5/Expressway, 6/Ramp
	TOLL	Toll Value in current year dollars
	TOLLGRP	Toll Group Code
	AMLANE	AM Peak No. of Lanes
	AMLIMIT	AM Peak Limit Code (0-9)
	PMLANE	PM Peak No. of Lanes

File Name	Variable Name	Description
	PMLIMIT	PM Peak Limit Code (0-9)
	OPLANE	Off-Peak No. of Lanes
	OPLIMIT	Off-Peak Limit Code (0-9)
	EDGEID	Geometric network link identifier
	LINKID	Logical network link identifier
	NETYEAR	Planning year of network link
	SHAPE_LENG	Geometric length of network link (in feet)
	PROJECTID	Project identifier
	TRANTIME	Unused place marker
	WKTIME	Unused place marker
	MODE	Unused place marker
	SPEED	Unused place marker

Notes:

- The mode choice model requires that all costs be in 2007 dollars, which was the calibration year.
- Link limit codes are shown in Table 25.

Table 25 Link limit codes

Limit Code	Description and Vehicles Allowed
0	All vehicles allowed
2	HOV 2+ occupant vehicles allowed
3	HOV 3+ occupant vehicles allowed
4	All vehicles allowed, except for trucks
5	Airport passenger auto driver trips allowed
9	Closed link or transit only link. Example use cases: a) Transit only: Link closed to all traffic other than transit vehicles. If no transit routes traverse the link, then it is essentially closed to all vehicle traffic. b) Directional coding of managed-lane facilities, such as HOV and HOT, where some links are effectively closed to vehicles in some directions, during some periods of the day. c) Change in link directionality through time, e.g., if a road is 2-directional in some network years, but changes to a one-way street in the future, then limit 9 is used on the direction that is closed in the future. d) Reversible lanes, e.g., Rock Creek Parkway has limit code 9 in the off-peak direction, since it is closed for travel in that direction. e) Roads that do not exist in early years of the plan but are built in later years. For example, I-270 has future-year improvements in 2030 north of I-370. In the early years, this links are coded as limit code 9, since they do not yet exist.

Table 26 Toll Parameter File (Toll_esc.dbf)

File Name	Variable Name	Description
Toll_Esc.dbf	Tollgrp	Toll group code 1 = Flat toll (pertains to most existing tolled facilities); 2 = Toll that varies by time of day (e.g. ICC), 3+= Tolls that change dynamically based on congestion level (e.g., VA HOT lanes/Express Lanes)
	Escfac	Deflation factor override. Can be used to group various toll policies.
	Dstfac	Distance (per mile) based toll factor in present year cents/dollar (optional)
	AM_Tftr	AM period Toll factor
	PM_Tftr	PM period toll factor
	OP_Tftr	Off-peak period toll factor
	AT_MIn	Area Type minimum override (optional)
	AT_Max	Area Type maximum override (optional)
	TollType	*Toll Type (1=operating in calibration year, 2= operating after calibration year)*

Table 27 Outputs of the set-up and highway network building process

Highway, transit deflator files	Trn_Deflator.txt, Hwy_Deflator.txt	Text
Summary text file of Fare CPI assumptions used	MFARE2_CPI.txt	Text
Zone centroid co-ordinates	TAZ_XYs.dbf	DBF
1-mile floating land use	Floating_LU.dbf	DBF
Area type file	AreaType_File.dbf	DBF
Unloaded/built highway network file	ZONEHWY.NET	Binary
Summary text file of Fare CPI assumptions used	MFARE2_CPI.txt	Text
Zonal K-factors	HBW_K.MAT, HBS_K.MAT, HBO_K.MAT, NHW_K.MAT, NHO_K.MAT	Binary

Table 28 Zonal Area Type File (AreaType_File.dbf)

Variable Name	Description
TAZ	TAZ Number (1-3,722)
POP_10	One-mile "floating" Population density
EMP_10	One-mile "floating" Employment density
AREA_10	One-mile "floating" Area
POPDEN	One-mile "floating" Population density
EMPDEN	One-mile "floating" Employment density
POPCODE	Population density code (1 -7)
EMPCODE	Employment density code (1 -7)
ATYPE	Area Type (1-6)

Ref: "I:\ateam\docum\fy19\tpb_tdfm_gen2\ver2.3\travel_model_user_guide\AreaType_File.xlsx"

The one-mile floating density is calculated by using the TAZ centroids and a one-mile point buffer around these centroids.

Table 29 Unloaded binary highway network file (Zonehwy.net)

File Name	VariableName	Description
zonehwy.net	A	A Node
	B	B Node
	DISTANCE	Link Distance in miles (x.xx)
	SPDC	(Not used)
	CAPC	(Not used)
	JUR	Jurisdiction Code (0-23)
		0/dc, 1/mtg, 2/pg, 3/alr/, 4/alx,5, ffx, 6/ldn, 7/ pw, 8/(unused), 9/ frd, 10/how, 11/aa, 12/chs, 13/(unused), 14/car, 15/cal, 16/stm, 17/ kg, 18/fbg, 19/stf, 20/spts, 21/fau, 22/clk, 23/jef
	SCREEN	Screenline Code (1-38)
	FTYPE	Link Facility Type Code (0-6)
		0/centroids, 1/Freeways, 2/Major Art., 3/Minor Art, 4/ Collector, 5/ Expressway, 6/ Ramp
	TOLL	Toll value in current year dollars
	TOLLGRP	Toll Group Code (1-9999)
	<Period>LANE	<Period> No. of Lanes
	<Period>LIMIT	<Period> Limit Code (0-9)
	EDGEID	Geometry network link identifier
	LINKID	Logical network link identifier
	NETWORKYEA	Planning year of network link
	SHAPE_LENG	Geometry length of network link (in feet)
	PROJECTID	Project identifier
	TAZ	TAZ (1-3,722)
	ATYPE	Area Type (1-6)
	SPDCLASS	Speed Class
	CAPCLASS	Capacity Class
	DEFLATIONFTR	Deflation factor for converting existing year costs to 2007 costs
	<Period>TOLL	<Period>Toll value in current year cents (if applicable)
	<Period>TOLL_VP	<Period>Toll of future, variably priced facility only
	<Period> HTIME	<Period> Highway Time (min)
Key		
<Period>=	AM	AM Peak Period (6:00-9:00 AM)
	MD	Mid Day (9:00 AM - 3:00 PM)
	PM	PM Peak Period (3:00 - 7:00 PM)
	NT	All remaining hours

12.2 Application Details

The *Set_CPI.S* script is used to produce deflation factor files (Trn_Deflator.txt and Hwy_Deflator.txt) which are used to convert present-year costs to constant-year (2007) costs. The deflation parameter files are inputs to the *V2.3_Highway_Build.s* and *MFARE2.S* scripts. This procedure has been established to ensure that cost deflation for highway tolls and transit fares are treated consistently.

The *Set_CPI.S* script reads a preexisting look-up table (\INPUTS\CPI_File.txt) containing historical annualized CPI figures published by the U.S. Bureau of Labor Statistics beginning with the model calibration year, 2007. The CPI figures are based on the U.S. city average of all urban consumers (100 = 1982-84).   An example listing of the file appears in Figure 26.

Figure 26 Consumer price index file (CPI_File.txt)

```
;; - MWCOG V2.3 Travel Model - Cost deflation Table
;; - 1/30/2017 - RN
;; Data from BLS / All Urban Consumers (CPI-U) US City Avg.1982-84=100.0
;; http://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008

InflationFTR         = 1.0   ; Inflation Assumption (DEFAULT IS 1.0)
Defl_OverRide        = 0.0   ; Deflation Override   (DEFAULT IS 0.0)  If Non-zero it is used as deflator
                             ; Used as deflator IF NON-ZERO
BaseCPIYear          = 2007  ; Base year of the CPI Table
CurrCPIYear          = 2017  ; Current year on  CPI table below (Year for which complete annual CPI data is available)
;
;=============================================================
; Establish historic CPI table and Deflation Factor          =
;=============================================================
;
      LOOKUP Name=CPI_Table,
             LOOKUP[1]   = 1,Result = 2,          ;;  CPI index (from US BLS)
             LOOKUP[2]   = 1,Result = 3,          ;;  Compounded Growth Rate From Base Year
             LOOKUP[3]   = 1,Result = 4,          ;;  Deflation Factor
             Interpolate = N, FAIL=0,0,0,list=Y,
          ;;
          ;;               (((YrCPI/BsCPI)^(1/n))-1.0)*100  BsCPI/YrCPI)
          ;;                      Annual_Avg.                Historic Deflation
          ;; YEAR    CPI          Growth_Rate(%)             Factor
          ;; ----   -----       -----------------           -----------
        R=' 2007,  207.342,          0.00,                  1.0000 ', ; <--- BaseCPIYear
          ' 2008,  215.303,          3.84,                  0.9630 ', ;
          ' 2009,  214.537,          1.72,                  0.9665 ', ;
          ' 2010,  218.056,          1.69,                  0.9509 ', ;
          ' 2011,  224.939,          2.06,                  0.9218 ', ;
          ' 2012,  229.594,          2.06,                  0.9031 ', ;
          ' 2013,  232.957,          1.96,                  0.8900 ', ;
          ' 2014,  236.736,          1.91,                  0.8758 ', ;
          ' 2015,  237.017,          1.69,                  0.8748 ', ;
          ' 2016,  240.007,          1.64,                  0.8639 ', ;
          ' 2017,  245.120,          1.69,                  0.8459 '  ; <--- Curr(ent)CPI Year
; --- end of CPI File -----------
; -------------------------------
```

Ref: Z:\ModelRuns\fy19\CGV2_3_75_Visualize2045_CLRP_Xmittal\2019_Final\Inputs\CPI_File.txt

The script computes a cost deflation factor using the CPI table and the parameters *BaseCPIYear*, *CurrCPIYear, InflationFTR* (all specified in the above text file), and **the _*Year*_ environment variable specified in the "Run_ModelSteps" batch file**. These parameters are defined as:

- **BaseCPIYear** =   the base (or calibration) year of the travel model

- **CurrCPIYear** = the most recent year for which historical CPI data exists (as reflected in the CPI table)
- **_Year_** = the year of the modeled scenario (as defined in the Run_ModelSteps.bat file)
- **InflationFTR** = Factor reflecting special CPI growth assumptions beyond CurrCPIYear that might be considered in scenario testing. For example, a value of 1.0 indicates future cost escalation is assumed to remain constant with the historical rate of inflation; a value of 2.0 would indicate that the future cost escalation is assumed to be twice the historical rate of inflation; a value of 0.5 would indicate that the future cost escalation is assumed to be one half of the historical rate of inflation, etc. The default value is 1.0.

Under default conditions, if the modeled year (_*Year*_) is less than or equal to *CurrCPIYear*, the CPI factor will equal CPI_{2007}/ $CPI_{_Year_}$from values provided in the CPI table. If the modeled year (_*Year*_) is greater than *CurrCPIYear*, the CPI factor will equal (CPI_{2007}/ $CPI_{CurrCPIYear}$) from values provided in the CPI table. The user may optionally invoke the *InflationFTR* parameter to arrive at a deflation factor that reflects something other than the "historical inflation rate" assumption. In addition to the output deflation factor files mentioned above, the script also writes a text file (Mfare2_CPI.txt) that lists the input and output parameter values used.

The Set_Factors.s script is used to generate a family of K-factors by modeled trip purpose, to be used subsequently by the trip distribution process. The K-factors are jurisdiction-based and have been formulated during the calibration and validation phase of the model development process. Separate K-factor files are produced by purpose as Cube/Voyager binary matrix files (zone-to-zone). These files are currently stored in the Support folder, though there has been some thought of moving these into the inputs folder to prevent sharing violations when multiple model runs are launched concurrently. As of the Ver. 2.3.57a model, *Set_Factors.s* is also used to generate the station names file (station_names.dbf), which is stored in the INPUTS folder, used in the transit assignment summary process, and is derived from information found in the station file (station.dbf, see Table 38).

It is useful to understand the basic elements of the highway and transit networks that are reflected in the highway link input file (link.dbf) to the Version 2.3 model. The highway elements are shown in Table 30.

Table 30 Elements of the highway network

Highway Network Element	What It Represents	Node No. Ranges	Notes
Zone centroid	Center of activity for the TAZ; Start and end point for trips	1-3722	3676-3722 allocated as external stations. 3723-5000 reserved for TAZ expansion. Established ranges for each jurisdiction. Some TAZs are unused
Station PNR centroid	Location of the station's park-and-ride lot. Used to develop congested highway times between each TAZ and each PNR lot.	5001-7999*	5001-5999 for Metrorail. 6000-6999 for commuter rail. 7000-7999 for LRT, BRT, and streetcar.
Highway node	Highway intersections or junctions, including where zone centroids connect to the highway network	20000-60000	Established ranges for each jurisdiction.

Highway Network Element	What It Represents	Node No. Ranges	Notes
Zone centroid connectors	Connection from zone centroid to the highway network. One zone centroid connector can represent multiple local roads.		Facility type (FTYPE) = 0
PNR lot connectors	Connection from PNR lot to the highway network		Facility type (FTYPE) = 4
Highway links	Road segments		0 = centroid connectors; 1 = freeways; 2 = major arterials; 3 = minor arterials; 4 = collectors; 5 = expressways; 6 = ramps on freeways and arterials; 9 = transit only;

Notes: * Station PNR centroids (a.k.a. dummy station centroids) are not required for Mode 5 (LRT) or Mode 10 (BRT/streetcar).[78] For the sake of consistency, the current COG coding practice is to refrain from using station PNR centroids for LRT, BRT, and streetcar. In other words, in the station file, the STAC variable is coded with a value of zero.

The network includes two types of centroids: a zonal centroid, which represents the geographic center of land activity within a TAZ, and a park-and-ride (PNR) lot centroid (also known as a "station centroid," "dummy PNR centroid"), which represents PNR lot locations at Metrorail and commuter rail stations. The PNR centroid represents a kiss-and-ride (KNR) drop-off point if no PNR lot exists at a given station. Within the station file (station.dbf), the PNR centroid/station centroid is denoted with the variable name STAC. Each Metrorail station and commuter rail station should have its own unique STAC. The two centroid types are assigned specific numbering ranges. TAZ centroids are numbered 1-3722 and PNR centroids are numbered 5001-7999. The numbering gap between the TAZ and PNR ranges, 3723-5000, are reserved for future TAZ assignments.[79] The two centroid types are employed so that highway level-of-service (LOS) matrices may be built, not only between TAZs, but also between TAZs and PNR lots.

Highway nodes representing intersections or highway access points from TAZs or PNR lots are assigned a number from the following range: 20000 to 60000. Network links (i.e., centroid connectors and highway links) are assigned facility type ("Ftype") attributes ranging from 0 to 6.

The highway network building process -- i.e., the process for creating a binary highway network file which is used in subsequent modeling steps -- is undertaken with two scripts that are executed in sequence: *AreaType_File.s* and *V2.3_Highway_Build.s* (page A-3). The *AreaType_File.s* script, which reads a preexisting zonal land activity file (Zone.dbf) and a highway node coordinate file (Node.dbf), computes the area type code associated with each TAZ. Area type codes range from 1 to 6 and are based on population and employment density, as shown in Table 31.

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[78] Jain to Milone and Moran, "MWCOG Network Coding Guide for Nested Logit Model (First Draft: September 20, 2007; Updated February 2008 and October 2010)," 6 and 10.

[79] The existing Version 2.3 scripts, inputs, and support files would need to be modified if additional TAZs were added to the highway network.

Table 31 Area type codes, based on population and employment density

One-Mile “Floating” Population Density (Pop/Sq mi)	One- mile “Floating” Employment Density (Emp/Sq mi)						
	0-100	101-350	351-1,500	1,501-3,550	3,551-13,750	13,751-15,000	15,001+
0-750	6	6	5	3	3	3	2
751-1,500	6	5	5	3	3	3	2
1,501-3,500	6	5	5	3	3	2	2
3,501-6,000	6	4	4	3	2	2	1
6,001-10,000	4	4	4	2	2	2	1
10,000-15,000	4	4	4	2	2	2	1
15,001+	2	2	2	2	2	1	1

The *AreaType_File.s* script produces three files which are used as inputs to the v2.3_highway_build.s script:

- TAZ_Xys.dbf (zonal coordinates),
- Floating_LU.dbf (a zonal file containing the area, population, and employment within one mile),[80]
- Areatype_file.dbf (a zonal file containing the associated area type, in accordance with the land activity file)

The V2.3_Highway_Build.S script reads the zonal area type file, along with a node file, a link attribute file, a zone file, and four parameter files. The parameter files include initial speed and capacity lookup files (AMSpd.lkp, MDSpd.lkp), both arrayed by facility type and area type. The deflation file created by the SET_CPI.s script (Hwy_Deflator.txt) is also read into the highway building script. Finally, a toll parameter/escalation file (Toll_esc.dbf) is also used by the script. The file contains a number of toll-related parameters that are indexed by a tolled facility code (tollgrp) which is included as a link attribute.

The highway building process consists of the following steps:

1) Each highway link is evaluated against all TAZ centroids to determine its nearest zone (i.e., the TAZ centroid nearest to the airline mid-point of the link a-node and b-node). The nearest zone is then saved to a temporary link file containing the A-node, B-node, and nearest TAZ.

---

[80] TAZ-level floating density is calculated by using the TAZ centroids and creating a 1-mile point buffer around each centroid.

2) The link file, zonal area type file, and link-TAZ (from step 1) are merged to enable the zonal area type of the nearest TAZ to be assigned to each link. The link file contains basic link attributes, including distance, facility code, time-of-day-period-specific (AM, PM, OP) lanes and limit codes, coded tolls, toll group codes, jurisdiction, and screenline codes.
3) Toll parameters are merged to each link on the basis of the tollgrp code.
4) Speed and capacity classes are next defined as a two-digit integer, where the first digit is the facility type and the second digit is the area type.
5) Period-specific tolls (AM, PM, and OP) are computed. The general form of the toll computation is:

   <prd>Toll = (Toll + (DstFac$_t$ * Distance * <prd>_TFtr$_t$)) * (EscFac$_t$ if > 0.0; Otherwise: Hdefl)

<u>Where:</u>

<prd>Toll = period-specific toll coded on link in constant year dollars (e.g., Amtoll)
Toll = link-coded "Toll" link attribute value
DstFac$_t$ = distance factor (cents/mi) for toll group "t", as specified in Toll_Esc.dbf
Distance = link-coded distance (miles)
<prd>_TFtr$_t$ = period-specific factor for toll group "t" as specified in Toll_Esc.dbf
Hdefl = Default highway deflation factor based on CPI assumptions (Set_CPI.s)
Esc_Fac$_t$ = Hwy. deflation factor *override* for toll group "t", as specified in Toll_Esc.dbf

6) A period-specific toll type code (<prd>Toll_VP) is established to distinguish whether the tolled link existed during the model calibration year or the tolled link is a future, variably priced facility. This information is relevant to subsequent toll skimming.
7) Initial AM and OP speeds are assigned, based on facility and area type codes.
8) Midday (MD) and Night (NT) attributes are set to off-peak (OP)-related attributes defined above

The binary network file resulting from the highway network building process is named Zonehwy.net. Variables that are included in the zonehwy.net file are described in Table 32.

Table 32 zonehwy.net file Variables description

Variable Name	Description
A	A-Node
B	B-Node
DISTANCE	Link Distance in miles (x.xx)
SPDC	Not used
CAPC	Not used
JUR	Jurisdiction Code (0-23) *0/dc, 1/mtg, 2/pg, 3/alr/, 4/alx,5, ffx, 6/ldn, 7/ pw, 8/(unused), 9/ frd, 10/how, 11/aa, 12/chs, 13/(unused), 14/car, 15/cal, 16/stm, 17/ kg, 18/fbg, 19/stf, 20/spts, 21/fau, 22/clk, 23/jef*
SCREEN	Screenline Code (1-38)
FTYPE	Link Facility Type Code (0-6) *0/centroids, 1/Freeways, 2/Major Art., 3/Minor Art, 4/Collector, 5/Expressway, 6/Ramp*

Variable Name	**Description**
TOLL	Toll Value in current year dollars
TOLLGRP	Toll Group Code (1-9999)
<Period>LANE	<Period> No. of Lanes
<Period>LIMIT	<Period> Limit Code (0-9)
EDGEID	Geometry network link identifier
LINKID	Logical network link identifier
NETWORKYEA	Planning year of network link
SHAPE_LENG	Geometry length of network link (in feet)
PROJECTID	Project identifier
TAZ	TAZ (1-3722)
ATYPE	Area Type (1-6)
SPDCLASS	Speed Class
CAPCLASS	Capacity Class
DEFLATIONFTR	Factor for deflating current year tolls to constant year tolls
<Period>TOLL	<Period> Toll Value in current year dollars
<Period>TOLL_VP	<Period> Toll Value in current year dollars - Variably priced tolled facilities only
<Period> HTIME	<Period> Highway Time - based on initial highway lookup speeds
KEY	
<Period>= AM	AM Peak Period (6:00 AM - 9:00 AM)
MD	Midday (9:00 AM - 3:00 PM)
PM	PM Peak Period (3:00 PM - 7:00 PM)
NT	All remaining hours ("nighttime")

13 Highway Skim File Development

13.1 Overview

Highway skimming begins with path building, the process of building minimum-impedance paths from every TAZ to every other TAZ. After paths have been built, the paths can be "skimmed," i.e., the paths are traversed, and key variables are summed over the paths. The variables that are skimmed include travel times, distances, and tolls. The resultant zone-to-zone sums are saved in one or more skim matrices. The input to the skimming process is usually a loaded network with congested travel speeds, generated from a traffic assignment process. Although traffic assignment is conducted for four time-of-day periods (AM peak period, midday, PM peak period, and nighttime), the travel model is set up to use skims for only two time-of-day periods: a peak period (represented by the AM peak period) and an off-peak period (represented by the midday period). Highway skims in the Version 2.3 model are generated after each traffic assignment step.

Highway skims are generated by time period (AM and Midday), and by highway mode (SOV, HOV 2-occupant, HOV 3+occupant). In addition, truck skims are generated for the midday period only. Mode-specific paths are very important in the Washington, D.C. region, due to special operating restrictions, particularly during the AM peak period.

The TPB's highway skimming is done twice: once to develop zone-to-zone (3722 x 3722) skim matrices and then again to develop zone/PNR lot-to-zone/PNR lot (7999 x 7999) skim matrices. The latter set enables restrained highway speeds and distances to be calculated between zones and PNR lots, thus allowing transit auto-access links to be built. The entire highway skimming process is applied with the scripts named *Highway_Skims_am.s, Highway_Skims_md.s, modnet.s, Highway_Skims_mod_am.s, Highway_Skims_mod_md.s,*[81] *joinskims.s, and Remove_PP_Speed.s*. These are invoked with the *PP_Highway_Skims.bat* file in the initial or pump-prime iteration (see page A-4 of Appendix A) and the *Highway_Skims.bat* file (see page A-11) in the standard iterations. The *Remove_PP_Speed.s* script is executed in the pump-prime iteration only. The principal inputs and outputs are shown in Table 33 and Table 34 , respectively.

Table 33 Inputs to the highway skim file development

Built highway network file	<ITER>_HWY.NET	Binary
Toll minutes equivalent	support\toll_minutes.txt	Text
AM toll factors by vehicle type	Inputs\AM_Tfac.dbf	DBF
MD toll factors by vehicle type	Inputs\MD_Tfac.dbf	DBF

Note: <ITER> =PP, i1…i4   <Prd>= AM and MD

---

[81] Prior to build 37, there was one script (*Highway_Skims_mod.s*), which had a loop covering the two time periods, AM and midday. However, it was found that this script would crash on some hardware configurations, when running Voyager 5.1.3, resulting in the following errors: 1) Voyager.exe, APPCRASH, TPPDLIBX.DLL; and 2) Voyager, APPCRASH, MSVCR90.DLL. The script was then split into two files (*Highway_Skims_mod_am.s* and *Highway_Skims_mod_md.s*), which eliminated this problem.

Table 34 Outputs of the highway skim file development

Total highway skims	<ITER>_SKIMTOT.TXT	Text
Truck skims	<ITER>_MD_TRK.SKM	Binary
SOV skims	<ITER>_<Prd>_SOV.SKM	Binary
HOV2 skims	<ITER>_<Prd>_HOV2.SKM	Binary
HOV3+ skims	<ITER>_<Prd>_HOV3.SKM	Binary
SOV skims (used by mode choice model)	<ITER>_<Prd>_SOV_MC.SKM	Binary
HOV2 skims (used by mode choice model)	<ITER>_<Prd>_HOV2_MC.SKM	Binary
HOV3+ skims (used by mode choice model)	<ITER>_<Prd>_HOV3_MC.SKM	Binary
AM highway skims	<ITER>_HWY_AM.SKM	Binary
Off peak highway skims	<ITER>_HWY_OP.SKM	Binary
Network with added station centroid connectors	<ITER>_HWYMOD.NET	Binary
Walk access links	WalkAcc_Links.dbf	DBF
	<ITER>_<Prd>_SOV_MOD.SKM	Binary
	<ITER>_<Prd>_HOV2_MOD.SKM	Binary
	<ITER>_<Prd>_HOV3_MOD.SKM	Binary
Highway network with PP speeds removed	ZoneHWY.NET	Binary

Note: <ITER> =PP, i1…i4 <Prd>= AM and MD

13.2 Application Details

The highway skimming process is used to develop time, cost, and toll values between origin/destination (i/j) pairs of zones on a minimum-impedance path. The skimming process reads a highway network input file with preexisting restrained speeds. The restrained speeds used in the pump prime (PP) iteration initially are table look-up values based on time period (AM, Off-peak), facility type, and area type. After the PP iteration is completed (i.e., after the PP traffic assignment process is completed), the highway skimming is accomplished using traffic assignment-based link speeds. The generalized impedance for which paths are developed for highway skimming is defined as follows:

Equation 1 Converting tolls into time-equivalent minutes of impedance

$$(\text{Impedance})_{\text{v}} = (\text{Restrained over-the-network time})_{\text{v}} + (\text{Toll-related time})_{\text{v}}$$

or

$$\begin{aligned}(\text{Impedance})_{\text{v}} = {} & (\text{Restrained over-the-network time})_{\text{v}} \\ & + ([\text{Toll cost}]_{\text{v}} \times [\text{Time rate}]_{\text{v}} \times [\text{Vehicle factor}]_{\text{vf}})\end{aligned}$$

where

$(\text{Impedance})_{\text{v}} = \text{Restrained over-the-network time}_{\text{V}} + \text{Toll-related Time}_{\text{V}}$

$(\text{Restrained over-the-network time})_{\text{v}}$
$= \text{Congested/restrained network travel time (min) for vehicle class “V”}$

$[\text{Toll cost}]_{\text{v}} = \text{Tolls (2007 dollars)paid by vehicle class “V”, if a tolled facility was used}$

$[\text{Time rate}]_{\text{v}} = \text{Time valuation (min/2007 dollar) of toll costs for vehicle class “V”}$

$[\text{Vehicle factor}]_{\text{vf}} = \text{Vehicle class factor for tolled facility “F”}$

Note: Vehicle classes are: SOVs, HOV2-occs, HOV3+occs, Commercial Vehicles, Trucks, and airport passenger vehicles.

The assumed time rates are provided by vehicle class and time period in toll_minutes.txt (see below), which is located in the Support folder. The values shown are derived from average household income levels and information from the 2007/08 HTS. The values should not be altered.

```
;
;     ==================================================================
;     = Equivalent Toll Minutes by Time Prd & Vehicle Type             =
;     = in minutes per 2007 dollar - rm 1/7/11                         =
;     ==================================================================
;
;    AM Peak           Midday            PM Peak           Night
;---------------  ---------------    --------------     --------------
  SVAMEQM = 2.5     SVMDEQM = 3.0    SVPMEQM = 3.0     SVNTEQM = 3.0 ; <--- SOVs
  H2AMEQM = 1.5     H2MDEQM = 4.0    H2PMEQM = 2.0     H2NTEQM = 4.0 ; <--- HOVs-2 Occ
  H3AMEQM = 1.0     H3MDEQM = 4.0    H3PMEQM = 1.0     H3NTEQM = 4.0 ; <--- HOVs-3+Occ
  CVAMEQM = 2.0     CVMDEQM = 2.0    CVPMEQM = 2.0     CVNTEQM = 2.0 ; <--- Comm Veh
  TKAMEQM = 2.0     TKMDEQM = 2.0    TKPMEQM = 2.0     TKNTEQM = 2.0 ; <--- Trucks
  APAMEQM = 2.0     APMDEQM = 2.0    APPMEQM = 2.0     APNTEQM = 2.0 ; <--- Apaxs
```

The vehicle factors are provided by time period in the inputs files AM_Tfac.dbf and MD_Tfac.dbf. An example of the AM_Tfac.dbf file is shown below. The file is available to allow for the ability to reflect a facility-specific toll policy differential between vehicle classes. The table below specifies the default assumption that tolls do not vary between vehicle classes, except for trucks, which are assumed to pay 2.5 times the toll that an auto would pay.

TOLLGRP	AMSOVTFTR	AMHV2TFTR	AMHV3TFTR	AMCOMTFTR	AMTRKTFTR	AMAPXTFTR
1	1.0000	1.0000	1.0000	1.0000	2.5000	1.0000

Information about the “toll setting” process that is used to estimate reasonable toll values can be found in two technical memos.[82]

The standard zone-to-zone highway skims are developed by the scripts *Highway_Skims_am.s* and *Highway_Skims_md.s*. The scripts produce skim files pertaining to two time periods (AM and midday) and to four mode/path types (SOV, HOV2, HOV3+, and truck). The truck skim file contains one table

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[82] Jinchul Park to Team B Modelers, “Processes Related to Toll Setting in Version 2.3 Model (Draft),” Memorandum, October 12, 2012; Jinchul Park to Files, “HOT Lane Modeling Process of MWCOG/TPB (Draft),” Memorandum, October 12, 2012.

pertaining to travel time. The SOV and HOV skim files **contain four tables**: 1) time (min), 2) distance in implied tenths of miles, 3) total toll (year-2007 cents), and 4) variably priced tolls (year-2007 cents).

Based on a past analysis of Version 2.2 model forecasts, TPB staff found substantial costs associated with planned variably priced highway facilities (e.g., the Northern Virginia HOT lanes and the ICC) caused counterintuitive mode choice model results. Essentially, the added person trips induced by the HOT lane's accessibility benefit tended to be allocated among non-SOV modes because of the substantial costs for paying SOVs to use the HOT lane costs. The result was not considered reasonable since the objective of the facility was to attract paying SOVs by selling a travel time benefit. Staff speculated that the result may be attributed to the specification of the mode choice model: the "SOV-pay" alternative was not included in the choice set when the model was calibrated (indeed, no such facility had ever operated in the region). It was decided that the potentially extreme costs associated with future-year, variably priced highway facilities should **not** be considered by the mode choice model **as monetary values** in application. **Instead, tolls on variably priced facilities are expressed as equivalent minutes that are added to the highway time**. This approach has been adopted for the Version 2.3 application. Consequently, two sets of SOV and HOV skim files are created, one in which all toll facility costs are skimmed (e.g., <ITER>_AM_SOV.SKM), and another set in which the toll skims reflect base-year toll facilities only **and the time skims reflect highway times and tolls converted to equivalent time** (<ITER>_AM_SOV_MC.SKM). The former is used as an input to the trip distribution model and the latter is used as an input to mode choice.

The *joinskims.s* script is use to merge the six skim files used by the mode choice model into two files, <iter>_HWY_AM.skm and <iter>_HWY_MD.skm, which are read directly into the mode choice model.

Modnet.s reads the built highway network file and creates another modified binary network that includes an expanded set of zone centroids, zone centroids (numbered 1 to 3722) and PNR lot centroids (numbered 5001 to 7999). The expanded network is named <iter>_HwyMod.net. *Modnet.s* also generates a list of highway links that are considered as "walk network links" in the development of sidewalk (mode 13) links for the transit network.

The *Highway_Skims_Mod_am.s* and *Highway_Skims_Mod_md.s* scripts read the expanded network and create an expanded set of highway skims dimensioned 7999 by 7999, which includes highway skims between zone centroids as well as between zone and PNR lot pairs. The latter will be used subsequently to create auto access link attributes. As explained in footnote 81, prior to build 37, there was one script (*Highway_Skims_mod.s*), which had a loop covering the two time periods, AM and midday. However, it was found that this script would crash on some hardware configurations, but not on others. The script was then split into two files (*Highway_Skims_mod_am.s* and *Highway_Skims_mod_md.s*), which eliminated this problem.

The *Remove_PP_Speed.s* script is used to remove the "PP" iteration speed attributes from the highway network. This is necessary in the initial (PP) iteration, when table lookup speeds are to be replaced by traffic assignment speeds in the PP iteration.

14 Auto Driver Trip Development

14.1 Overview

The "auto drivers" step is used to convert daily auto person trip tables by occupant group (1, 2, and 3+) into auto driver trips by occupant group. This step occurs in between the mode choice model and the time-of-day model steps (see pages A-8 and A-14 of Appendix A). The auto driver step uses daily auto person trips estimated by the mode choice model and computes auto driver trips by occupant groups using matrix division. Because the mode choice file output includes only internal-to-internal movements, total external auto person trips produced in the trip distribution step are also used as a basis for developing external auto driver trips by occupant groups. External auto person trips produced by the trip distribution process are not stratified by occupant groups. The auto driver step uses modeled occupant disaggregation curves to develop external auto drivers by occupant groups.

The scripts used are *PP_Auto_Drivers.s*, invoked by the *PP_AutoDrivers.bat* file (see page A-8 of Appendix A) and *MC_Auto_Drivers.s*, invoked by the *Auto_Drivers.bat* file (see page A-14 of Appendix A). The inputs to this step are shown in Table 35. The outputs are shown in Table 36. The outputs consist of five purpose-specific auto driver files, each containing three tables (one for each occupant group). The output files contain both internal and external auto driver movements.

Note that the *PP_Auto_Drivers.s* script uses a pre-existing mode choice model output file that resides in the \inputs subdirectory, while the *MC_Auto_Drivers.s* script reads mode choice model output that is generated within the model execution stream. A pre-existing file must be used in the pump prime iteration in order to provide initial zonal mode choice percentages. TPB staff uses a pre-existing file that is as current and as reasonable for the modeled scenario as possible.

Table 35 Inputs to auto driver trip development

Pre-existing final iteration AEMS mode choice model output modal trip tables	???_NL_MC.MTT	Binary
Pump Prime iteration person trip tables	<iter>_???.PTT	Binary
Current iteration AEMS mode choice model output modal trip tables	???_NL_MC.MTT	Binary

Note: ??? = HBW, HBS, HBO, NHW, and NHO <ITER> =PP, i1…i4

14.2 Application Details

Table 36 Outputs of auto driver trip development

Auto drivers trips by trip purpose (t1= 1-occ. auto drivers, t2= 2-occ. auto drivers, t3 =3+ occ. Auto drivers	<ITER>_???_ADR.MAT	Binary

Note: ??? = HBW, HBS, HBO, NHW, and NHO <ITER> =PP, i1…i4,

15 Pre-Transit Network Processing

15.1 Overview

Prior to transit network building (shown on page A-5), a series of Cube Voyager scripts is executed to generate special transit-access links that are subsequently folded into the transit network, along with highway links, transit links, and transit lines. The scripts include *Parker.s* (used to generate PNR-lot-to-rail-station links), *walkacc.s* (used to develop zonal walk access links), *Adjust_Runtime.s* (to update the RUNTIME values for local bus service to account for worsening congestion), and *Autoacc5.s* (used to generate TAZ-to-station links, a.k.a., auto access links). The automated approach for generating these links has greatly streamlined the transit network coding process. Three of these programs (*Parker.s*, *walkacc.s*, and *Autoacc5.s*) were originally developed as stand-alone Fortran programs developed by AECOM Consult. TPB staff converted these three Fortran programs to Cube Voyager scripts to facilitate the implementation of future enhancements.

The inputs used by the above programs are list in Table 37. Specific file descriptions are shown in Table 38 through Table 41. The output files are shown in Table 42.

Table 37 Inputs to pre-transit network processing

Zonal land use file	Zone.dbf	DBF
Station file	Station.dbf	DBF
Highway node file	node.dbf	DBF
Supplemental walk link file	xtrawalk.dbf	DBF
Sidewalk network links	WalkAcc_Links.dbf	DBF
TAZ area that is within walking distance from transit stops	Areawalk.txt**	Text
Factors used to determine the amount of speed degradation, due to congestion, for local bus routes	Bus_Factor_File.dbf	DBF
Station mode-station type-max access dist. Lookup	StaAcc.dbf	DBF
Jurisdiction code- jurisdiction group lookup	Jur.dbf	DBF
List of zones connected to the Pentagon Metrorail station for the purpose of creating long-distance kiss-and-ride (KNR) links, which represent "slugging" or informal, ad-hoc carpooling	Pen.dbf	DBF
TAZ XY co-ordinates	TAZ_xys.dbf	DBF
SOV AM/Off-peak highway time skims file	AM_SOV_MOD.SKM, MD_SOV_MOD.SKM	Binary

** Areawalk.txt contains information needed to calculate zonal percent-walk-to-transit (PWT) values.

Input File Descriptions and Formats

Table 38 Variables in the transit station file (Station.dbf)

Name	**Type**	**Field Description**
SEQNO	N	Sequence Number
MM	C	Mode Code (M=Metrorail, C=Commuter rail, B=Bus, L=Light rail, N= BRT/streetcar)
NCT	**N**	**Access distance code (1, 2, 3, 0, 9, 8)** (See Table 39)
STAPARK	C	Does the station have a park-and-ride lot? (Y=yes; blank=no)
STAUSE	C	Is the station in use for the given year? (Y=yes; blank=no)
SNAME	C	Station Name/PNR lot name
STAC	N	Station centroid number (5001-7999), also known as a park-and-ride (PNR) lot centroid or a dummy PNR centroid"
STAZ	N	For the purposes of path building, the TAZ (1-3722) that represents the location of the station PNR lot. Usually the closest TAZ to the PNR lot.
STAT	N	Station Node (8000-8999, 9000-9999, 10000-10999)
STAP	N	Station park-and-ride (PNR) node number (11000-13999)
STAN1	N	Station bus node #1 (used to generate a station-to-bus-node connector)
STAN2	N	Station bus node #2 (used to generate a station-to-bus-node connector)
STAN3	N	Station bus node #3 (used to generate a station-to-bus-node connector)
STAN4	N	Station bus node #4 (used to generate a station-to-bus-node connector)
STAPCAP	**N**	**Parking capacity (number of spaces at the PNR lot)**
STAX	N	X coordinate of station/PNR lot (MD State Plane, NAD83, feet)
STAY	N	Y coordinate of station/PNR lot (MD State Plane, NAD83, feet)
STAPKCOST	**N**	**Peak period parking cost (daily cost, cents)**
STAOPCOST	**N**	**Off-peak parking cost (hourly cost, cents)**
STAPKSHAD	**N**	**Peak-period shadow price (currently not used)**
STAOPSHAD	**N**	**Off-peak-period shadow price (currently not used)**
FIRSTYR	N	Year of Station/PNR lot Opening (unused by scripts, but used as metadata)
STA_CEND	N	Project ID (Metadata)
	C	Scenario name, or left blank (Metadata)
	C	Comments, if any, regarding the file, since file cannot accept comment lines preceding the data lines

Notes: New variables are shown with bold font. The SEQNO variable does not correspond to the station node (STAT), and, unlike the STAT, cannot be assumed to stay the same over time.

Source: Jain, M. (2010, October). MWCOG network coding guide for Nested Logit Model (First draft: September 20, 2007; Updated February 2008 and October 2010). Memorandum.

The station file (station.dbf) is created by the create-station-file function of COGTools using transit nodes and transfer links. The input files for this procedure[83] are pre-existing transit support files listed at the top of p. A-5. STAN1, STAN2, STAN3, STAN4 represent transit stop nodes, which are used to generate station-to-transit-node connectors. A node could be a bus bay, bus stop, a light rail stop, a light

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[83] Meseret Seifu to Files, "Create a Station File," Memorandum, July 20, 2011.

rail station, or a commuter rail station, etc. The information of these nodes is used in four scripts: *Autoacc5.s, Parker.s, Set_Factors.s*, and *Refine_Station_File.s*. One transit station could have STAN1, or STAN1 and STAN2, or STAN1, STAN2, and STAN3. A station with four STANs could have other station connections beyond these four that exist in the network geodatabase, but these are not shown explicitly in the station file.

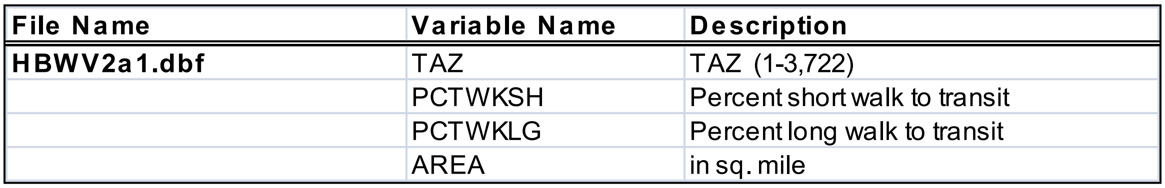
The "access distance code," known as NCT in the autoacc5.s script, is a newly added variable in the station file that controls the number, extent, and directionality of PNR/KNR access links generated for each parking lot (in the case of PNR) or each station (in the case of KNR). Table 39 describes the meaning of each of the six access distance codes.

Table 39 Interpretation of transit access distance codes (NCT): Metrorail, light rail, and bus PNR access distance codes and their meaning for the

Acc Dist Code	**Interpretation**
1	End-of-the-line station (e.g., Shady Grove Metro)
2	Intermediate station (e.g., Rockville Metro)
3	PNR close to a CBD (e.g., Rhode Island Ave. Metro, Fort Totten)
0	Only KNR-access links generated (e.g., Braddock Road, National Airport, Clarendon)
9	Metrorail sta. in use, but no PNR/KNR access (e.g., Dupont Circle, Farragut North, Metro Ctr.)
8	Pentagon Metro Sta., allows for very long KNR links, to represent "slugging" (informal carpool)

The access distance code, along with the transit mode, determines the maximum link distance for the drive-access-to-transit links generated by autoacc5.s for the TPB nested-logit mode choice model. The maximum link distances for PNR are shown in Table 81. Although not shown in the table, the maximum allowed link distance for KNR links is 3 miles. It is also important to note that the KNR links are generated to Metrorail stations, light rail stations, streetcar stops, and bus stops with parking lots, but not commuter rail stations.

Table 40 HBW zonal parking costs/terminal time file (HBWV2a1.dbf)



File Name	**Variable Name**	**Description**
HBWV2a1.dbf	TAZ	TAZ (1-3,722)
	PCTWKSH	Percent short walk to transit
	PCTWKLG	Percent long walk to transit
	AREA	in sq. mile

For more information about short walk and long walk to transit, see section 21.4 ("Market segmentation") on page 164.

Table 41 Walk Access Links (WalkAcc_Lnks.dbf)

File Name	Variable Name	Description
WalkAcc_Links.dbf	A	A-Node
	B	B_Node
	DISTANCE	Link distance (in 1/100th s of miles)
	FTYPE	Link Facility Type Code (0-6)
		0/centroids, 1/Freeways, 2/Major Art., 3/Minor Art, 4/ Collector, 5/ Expressway, 6/ Ramp
	TAZ	TAZ (1-3,722)

Table 42 Outputs of pre-transit network processing

Transit support files in inputs subdirectory	met_link.tb, com_link.tb, lrt_link.tb, new_link.tb, met_node.tb, com_node.tb, lrt_node.tb, new_node.tb, bus_pnrn.tb, met_pnrn.tb, com_pnrn.tb, lrt_pnrn.tb, new_pnrn.tb, met_bus.tb, com_bus.tb, lrt_bus.tb, new_bus.tb	Text
Transit network walk link files	sidewalk.asc walkacc.asc support.asc	Text
Percent of TAZ within short/long walk from transit	HBWV2A1.dbf	DBF
	NLWalkPCT.txt	Text
PNR lot to station transfer links	metampnr.tb, comampnr.tb, busampnr.tb, newampnr.tb, lrtampnr.tb, metoppnr.tb, comoppnr.tb, busoppnr.tb, newoppnr.tb, lrtoppnr.tb	Text
Transit access link files	mrpram.asc, mrprop.asc, mrkram.asc, mrkrop.asc, cram.asc, crop.asc, buspram.asc, busprop.asc, buskram.asc, buskrop.asc, lrtam.asc, lrtop.asc, newam.asc, newop.asc, lrtkram.asc, lrtkrop.asc, newkram.asc, newkrop.asc, autoall.asc	Text

15.2 Application Details

It is important to understand the various elements of the Version 2.3 transit network system. The elements are listed in Table 43. The network consists of highway links, transit stops, PNR lots, rail stations, rail links, and transit lines (modes 1-10). The transit network also contains access links relating to zonal access connections including zone-to-transit-stop walking links (mode 16), and zone-to-KNR/PNR auto links (mode 11). The network also includes other walk-related connections such as sidewalk links used in transferring (mode 13), rail station-to-bus stop connections (mode 12), and PNR lot-to-station connections (mode 15). The above scripts are used to develop all of these types of "support" links, with the exception of station-to-bus transfer links which are addressed as part of pre-network development.

The Mode Choice Model chapter of this report addresses the how access links are developed by the *walkacc.s, Parker.s*, and the *Autoacc5.s* programs.

Table 43 Overview of Version 2.3 Transit Network Elements

Transit Network Element	Description	Numbering	Modes/Notes
Bus stop nodes	Highway nodes that reflect bus stops	20000 - 60000	boarding/alighting locations
PNR lots	Point location representing PNR lot	11001-13999	11001-11999 Metrorail
			12001-12999 Commuter rail
			13001-13999 LRT/BRT/Streetcar
Station	Point location representing rail stop	8001-10999	8001-8999 Metrorail
			9001-9999 Commuter rail
			10001-10999 LRT/BRT/New
Rail links	Fixed guideway segments connecting	-	Mode 3= Metrorail
	stations (non-highway transit links)		Mode 4 = Commuter rail
			Mode 5 = light rail
			Mode 10= BRT, Streetcar
Walk access links	TAZ -transit stop bike/ pedestrian connections	-	Mode 16= TAZ-to-transit stop node
			Mode 13= sidewalk links
Auto access links	TAZ-PNR lot driving connections	-	Mode 11
PNR lot-to station links	Walk transfer links from PNR lot to Station	-	Mode=15
Station-to-bus transfer link	Walk transfer links between stations & bus stops		Mode=12
Transit line files	Bus, Rail transit line data		Modes 1-10
	(line characteristics, node sequence of route)		

16 Transit Skim File Development

16.1 Overview

The transit skimming file process involves the development of 22 sets of level-of-service (LOS) skims corresponding to two time-of-day period (peak and off-peak)[84] by four sub-mode groups (Bus only, Metrorail only, Bus-Metrorail combination, and commuter rail) by three access mode (walk, PNR, KNR).[85] As shown on page A-5 of Appendix A, the transit network building and skimming scripts are named *Transit_Skims_CR.s, Transit_Skims_MR.s, Transit_Skims_AB.s, Transit_Skims_BM.s*. These four scripts are launched using two batch files:

- *Transit_Skim_All_Modes_Parallel.bat*
- *Transit_Skim_LineHaul_Parallel.bat*

Additionally, transit accessibility summaries are needed to support the vehicle ownership model. The *Transit_Accessibility.s* script is used for this purpose. The inputs out outputs to transit skimming are shown in Table 44 and Table 45, respectively.

Table 44 Inputs to transit skim file development

Local bus future time degradation factors	Bus_Factor_File.dbf	Binary
Transit line files	MODE1, MODE2AM, ... MODE10AM.TB MODE1, MODE2OP, ... MODE10OP.TB	Text
Transit path tracing selection criteria	PATHTRACE.S	Script block
Binary highway network	ZONEHWY.NET	Binary
Transit support files in inputs subdirectory	met_link.tb, com_link.tb, lrt_link.tb, new_link.tb, met_node.tb, com_node.tb, lrt_node.tb, new_node.tb, bus_pnrn.tb, met_pnrn.tb, com_pnrn.tb, lrt_pnrn.tb, new_pnrn.tb, met_bus.tb, com_bus.tb, lrt_bus.tb, new_bus.tb	Text
Transit network walk link files	sidewalk.asc walkacc.asc support.asc	Text
PNR lot to station transfer links	metampnr.tb, comampnr.tb, busampnr.tb, newampnr.tb, lrtampnr.tb, metoppnr.tb, comoppnr.tb, busoppnr.tb, newoppnr.tb, lrtoppnr.tb	Text
Transit access link files	mrpram.asc, mrprop.asc, mrkram.asc, mrkrop.asc, cram.asc, crop.asc, buspram.asc, busprop.asc, buskram.asc, buskrop.asc, lrtam.asc, lrtop.asc, newam.asc, newop.asc, lrtkram.asc, lrtkrop.asc, newkram.asc, newkrop.asc, autoall.asc	Text

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[84] For the calculation of average headways and run times, the peak period is represented by the AM peak hour and the off-peak period is represented by the five-hour midday period.

[85] This should equal 24 (2x3x4), but KNR access to commuter rail mode is not considered by the mode choice model, and so the total number of required path sets equals 22.

Table 45 Outputs of transit skim file development

Commuter rail skim files	SUPL_<Prd>_<AA>_CR.ASC SUPN_<Prd>_<AA>_CR.DBF TRNL_<Prd>_<AA>_CR.DBF <ITER>_*<Prd>_<AA>*_CR.STA <ITER>_*<Prd>_<AA>*_CR.SKM <ITER>_*<Prd>_<AA>*_CR.TTT	Text DBF DBF Binary Binary Binary
Metrorail support skim files	SUPL_<Prd>_<AA>_MR.ASC SUPN_<Prd>_<AA>_MR.DBF TRNL_<Prd>_<AA>_MR.DBF <ITER>_*<Prd>_<AA>*_MR.STA <ITER>_*<Prd>_<AA>*_MR.SKM <ITER>_*<Prd>_<AA>*_MR.TTT	Text DBF DBF Binary Binary Binary
All Bus support skim files	SUPL_<Prd>_<AA>_AB.ASC SUPN_<Prd>_<AA>_AB.DBF TRNL_<Prd>_<AA>_AB.DBF <ITER>_*<Prd>_<AA>*_AB.STA <ITER>_*<Prd>_<AA>*_AB.SKM <ITER>_*<Prd>_<AA>*_AB.TTT	Text DBF DBF Binary Binary Binary
Bus/Metrorail support skim files	SUPL_<Prd>_<AA>_BM.ASC SUPN_<Prd>_<AA>_BM.DBF TRNL_<Prd>_<AA>_BM.DBF <ITER>_*<Prd>_<AA>*_BM.STA <ITER>_*<Prd>_<AA>*_BM.SKM <ITER>_*<Prd>_<AA>*_BM.TTT	Text DBF DBF Binary Binary Binary
Job accessibility by transit	<ITER>_<Prd>_<AA>_[BM|MR]_JobAcc.dbf	DBF

Note: <Prd>= AM and OP <AA>= WK, DR, KR <ITER> =PP, i1…i4

16.2 Application Details

16.2.1 Skim file names and list of transit skim tables in the skim files

The skim files developed by the transit skimming process in the Ver. 2.3 travel demand model are shown in Table 46. Each filename is preceded by the speed feedback iteration: pp (pump prime), i1, i2, i3, i4. Each skim file contains 16 tables of information, as shown in Table 47.

Table 46 Skim files developed by the transit skimming process

	Time Period	
Submode	**AM Peak Skim Files**	**Off-Peak Skim Files**
Commuter Rail	<iter>_AM_WK_CR.SKM <iter>_AM_DR_CR.SKM (no CR KNR file is created)	<iter>_OP_WK_CR.SKM <iter>_OP_DR_CR.SKM (no CR KNR file is created)
Metrorail Only	<iter>_AM_WK_MR.SKM <iter>_AM_DR_MR.SKM <iter>_AM_KR_MR.SKM	<iter>_OP_WK_MR.SKM <iter>_OP_DR_MR.SKM <iter>_OP_KR_MR.SKM
Bus Only	<iter>_AM_WK_AB.SKM <iter>_AM_DR_AB.SKM <iter>_AM_KR_AB.SKM	<iter>_OP_WK_AB.SKM <iter>_OP_DR_AB.SKM <iter>_OP_KR_AB.SKM
Metrorail and Bus	<iter>_AM_WK_BM.SKM <iter>_AM_DR_BM.SKM <iter>_AM_KR_BM.SKM	<iter>_OP_WK_BM.SKM <iter>_OP_DR_BM.SKM <iter>_OP_KR_BM.SKM

Table 47 Skim tables contained in each transit skim file

Table No.	**Table Description**
1	In-Vehicle Time-Local Bus (0.01 min)
2	In-Vehicle Time-Express Bus (0.01 min)
3	In-Vehicle Time-Metrorail (0.01 min)
4	In-Vehicle Time-commuter rail (0.01 min)
5	In-Vehicle Time-new rail mode (0.01 min)
6	In-Vehicle Time-new bus mode (0.01 min)
7	Initial wait time (0.01 min)
8	Transfer wait time (0.01 min)
9	Walk access time (0.01 min)
10	Other walk time (0.01 min)
11	Added Transfer time (0.01 min)
12	No. of transfers (0 to N)
13	Drive-access time (0.01 min)
14	Drive-access distance (0.01 mile)
15	PNR-to-Station time (0.01 min)
16	PNR Cost (2007 cents)

Ref: Transit_Skim_Specs_2.xlsx

16.2.2 Description of local bus, future time degradation factors

Transit service is represented in the transit network using a series of transit routes, which are stored in transit "line" or "mode" files. There is one set of transit routes for the peak period (represented by AM peak period service) and one set of transit routes for the off-peak period (represented by the midday period). For each of the two time-of-day periods, each transit route has the following:

- Name (such as "WM04AI," or WMATA bus 4A, inbound),
- Flag indicating whether the route is one-way or two-way,
- Mode code (e.g., 1 = local bus),
- Average headway (FREQ[1]= 30, which means the bus comes every 30 minutes), and
- Average run time (i.e., the number of minutes from the start of the route to the end of the route, e.g., RUNTIME= 42 min.).

When developing the transit networks for a base year (i.e., a year close to the current year, such as 2016), the average headways and average run times come directly from the published schedules from the transit providers. These schedules can be in paper format or electronic format, such as GTFS. For a future-year transit network (such as 2040), however, the average headway and run time are unknown, so we use information from the latest published schedule (e.g., 2016). However, simply using the published schedules would likely result in bus speeds that are too fast, since they don't account for the added roadway congestion that is likely to occur in the future, i.e., it is likely that worsening road congestion over time would result in slower bus speeds. In particular, **local** bus service, which travels on local roads, might be slowed more than express bus service, which makes use of freeways and expressways for all or part of its routes. Thus, it would be good to have a relationship that relates future-year, congested road/link speeds to bus speeds. Before 2004, the COG/TPB travel model had no such relationship. In 2004, AECOM recommended that COG develop a relationship between link speeds and bus speeds, but cautioned against developing overly sensitive relationships.[86] For example, if one develops a direct relationship between the link speed and the bus travel times over that link, and if one road link becomes hyper congested, due, say, to excessive traffic or a network coding error, then the bus speed will drop to near zero. Consequently, COG/TPB staff developed a proposed solution that followed what was proposed in the Bruggeman/Woodford memo. The solution was what is known as the local bus, future time degradation factors, which are used to represent the fact that, as the highway network becomes more congested, there will be a slight degradation in **local** bus speeds over time. This technique was first used in the Version 2.1/D Travel Model,[87] and has been retained in the Version 2.2 and 2.3 travel models. In 2015, the local bus speed degradation factors were re-estimated,[88] and those re-estimated factors were part of the Ver. 2.3.57a travel demand model.

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[86] Jeff Bruggeman and Bill Woodford to Ronald Milone, "Comments on MWCOG Modeling Procedures," Memorandum, June 30, 2004.

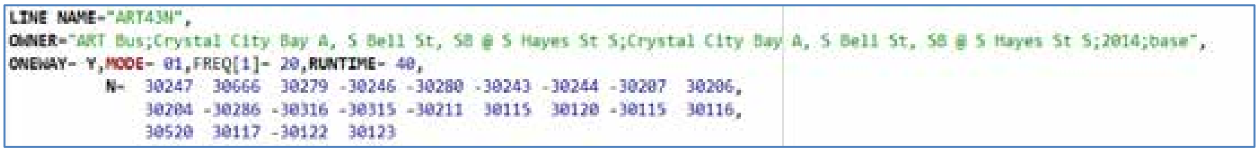
[87] Ronald Milone to Files, "Methodology for Linking Future Bus Speeds to Highway Congestion in the Version 2.1/D Model," Memorandum, July 14, 2004.

[88] Meseret Seifu and Ronald Milone, "Update of Local Bus Speed Degradation Model," Memorandum, March 19, 2015.

For the Ver. 2.3.66 model, the process was significantly updated, as was described in section 1.3.4 of the Ver. 2.3.66 user's guide[89] and a technical memo.[90] The major changes are as follows:

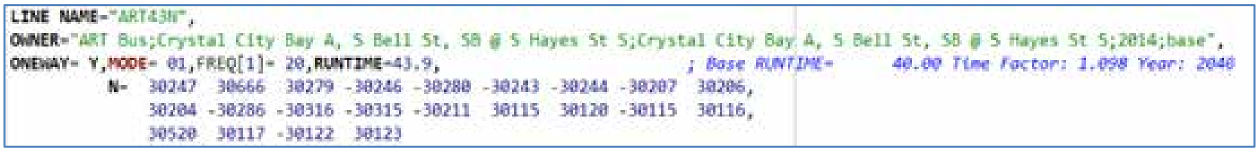
1. The text file Lbus_TimFTRS.asc has been replaced with the dBase file Bus_Factor_File.dbf.
2. A new script has been added (Adjust_Runtime.s). This script reads in the transit line files associated with the local bus routes (mode codes 1, 6, and 8), adjusts the RUNTIME values by the factors contained in Bus_Factor_File.dbf, and writes out revised mode 1, 6, and 8 files with the revised RUNTIME values. The script Adjust_Runtime.s is called from Transit_Skim_All_Modes_Parallel.bat.

An example of a local bus route **before** the adjustment of its RUNTIME variable is shown in Figure 27. An example of a local bus route **after** the adjustment of its RUNTIME variable is shown in Figure 28.



```
LINE NAME="ART43N",
OWNER="ART Bus;Crystal City Bay A, S Bell St, SB @ S Hayes St S;Crystal City Bay A, S Bell St, SB @ S Hayes St S;2014;base",
ONEWAY= Y,MODE= 01,FREQ[1]= 20,RUNTIME= 40,
         N=  30247  30666  30279 -30246 -30280 -30243 -30244 -30207  30206,
             30204 -30286 -30316 -30315 -30211  30115  30120 -30115  30116,
             30520  30117 -30122  30123
```

Figure 27 A local bus route before its RUNTIME value is updated



```
LINE NAME="ART43N",
OWNER="ART Bus;Crystal City Bay A, S Bell St, SB @ S Hayes St S;Crystal City Bay A, S Bell St, SB @ S Hayes St S;2014;base",
ONEWAY= Y,MODE= 01,FREQ[1]= 20,RUNTIME=43.9,                         ; Base RUNTIME=     40.00 Time Factor: 1.098 Year: 2040
         N=  30247  30666  30279 -30246 -30280 -30243 -30244 -30207  30206,
             30204 -30286 -30316 -30315 -30211  30115  30120 -30115  30116,
             30520  30117 -30122  30123
```

Figure 28 A local bus route after its RUNTIME value is updated to reflect road congestion predicted to occur in future years

Transit accessibility outputs are listed on Table 48.

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[89] Ronald Milone, Mark Moran, and Meseret Seifu, "User's Guide for the COG/TPB Travel Demand Forecasting Model, Version 2.3.66: Volume 1 of 2: Main Report and Appendix A (Flowcharts)" (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, February 13, 2017), 7, https://www.mwcog.org/transportation/data-and-tools/modeling/model-documentation/.

[90] Ronald Milone to Feng Xie et al., "Update to the V2.3.57a Model's Treatment of Bus Speed Factors," Memorandum, March 17, 2016.

Table 48 Job accessibility by transit file format description (<ITER>_<Prd>_<AA>_[BM|MR]_JobAcc.dbf)

Variable Name	**Description**
TAZ	TAZ (1-3722)
EMP35	Number of jobs accessible, from a given zone, within 35 minutes' travel time
EMP40	Number of jobs accessible, from a given zone, within 40 minutes' travel time
EMP45**	Number of jobs accessible, from a given zone, within 45 minutes' travel time
EMP50	Number of jobs accessible, from a given zone, within 50 minutes' travel time
EMPTOT	Total number of jobs accessible, from a given zone

** Only EMP45 is used from this file.

17 Transit Fare Development

17.1 Overview

Zone-to-zone transit fares are developed for the 22 paths sets described in the transit skimming section (section 16). As shown on page A-12 of Appendix A, the fares are developed using the scripts named *Prefarv23.s, Metrorail_Skims.S, Mfare1.s*, and *Mfare2.s*. The inputs to the fare process are shown in Table 49 and the outputs are shown in Table 50. After the fare process is executed, four scripts are used to combine transit skims and fares into consolidated submode files: *Assemble_Skims_CR.s, Assemble_Skims_MR.s, Assemble_Skims_AB.s*, and *Assemble_Skims_BM.s*.

Table 49 Inputs to transit fare development

Zonal transit walk percent	Inputs\NLwalkPct.txt	Text
Zonal TAZ-to-bus fare zone equivalence	Inputs\TAZFRZN.ASC	Text
Zonal Area Type file	AreaType_File.dbf	DBF
Zonal land use file	zone.dbf	DBF
Zonal TAZ-Mode choice district equivalency	areadef3722.prn	Text
Metro Station Link File	METLNKM1.TB**	Text
Metro Station XY File	METNODM1.TB**	Text
Metrorail turn penalty file	Inputs\trnpen.dat	Text
MFARE1 A1 (Coordinate) File	MFARE1.A1	Text
Metrorail station discount file	Inputs\MFARE1_STA_DISC.ASC	Text
WMATA tariff parameters	Inputs\tarriff.txt	Text
Transit fare deflation factor file	Trn_deflator.txt	Text
	<ITER>_*<Prd>*_*<AA>*_CR.STA <ITER>_*<Prd>*_*<AA>*_CR.SKM <ITER>_*<Prd>*_*<AA>*_MR.STA <ITER>_*<Prd>*_*<AA>*_MR.SKM <ITER>_*<Prd>*_*<AA>*_AB.STA <ITER>_*<Prd>*_*<AA>*_AB.SKM <ITER>_*<Prd>*_*<AA>*_BM.STA <ITER>_*<Prd>*_*<AA>*_BM.SKM	Binary
	<ITER>_*<Prd>*_*<AA>*_CR.FAR <ITER>_*<Prd>*_*<AA>*_MR.FAR <ITER>_*<Prd>*_*<AA>*_AB.FAR <ITER>_*<Prd>*_*<AA>*_BM.FAR	
Peak / Off-Peak MFARE2 Bus Fare Matrix	Inputs\busfaram.asc Inputs\busfarop.asc	Text
Peak /Off-Peak MFARE2 A2 File	FARE_A2.ASC	Text

Notes: <Prd>= AM and OP <AA>= WK, DR, KR <ITER> =PP, i1…i4

** These two files are originally in the Inputs folder, and then are copied to the Output folder in Transit_Skim_All_Modes_Parallel.bat

Table 50 Outputs of transit fare development

Summary of walkshed area and walkshed percentage	Prepare_MC_Zfile.txt	Text
Output Zone file for the NL mode choice model	ZONEV2.A2F	Text
A "complete" A2 file for the MFARE2.S	Fare_a2.asc	
Metrorail distance skims	RLDIST.SKM	Binary
Metrorail station to station fares	AM_Metrorail_Fares.TXT OP_Metrorail_Fares.TXT	Text
Zonal fares	<ITER>_*<Prd>*_*<AA>*_CR.FAR <ITER>_*<Prd>*_*<AA>*_CR.FR5 <ITER>_*<Prd>*_*<AA>*_CR.TXT <ITER>_*<Prd>*_*<AA>*_MR.FAR <ITER>_*<Prd>*_*<AA>*_MR.FR5 <ITER>_*<Prd>*_*<AA>*_MR.TXT <ITER>_*<Prd>*_*<AA>*_AB.FAR <ITER>_*<Prd>*_*<AA>*_AB.FR5 <ITER>_*<Prd>*_*<AA>*_AB.TXT <ITER>_*<Prd>*_*<AA>*_BM.FAR <ITER>_*<Prd>*_*<AA>*_BM.FR5 <ITER>_*<Prd>*_*<AA>*_BM.TXT	
Combined time and fare commuter rail skims	<ITER>_TRNAM_CR.SKM <ITER>_TRNOP_CR.SKM	Binary
Combined time and fare Metrorail skims	<ITER>_TRNAM_MR.SKM <ITER>_TRNOP_MR.SKM	Binary
Combined time and fare all bus skims	<ITER>_TRNAM_AB.SKM <ITER>_TRNOP_AB.SKM	Binary
Combined time and fare bus/Metrorail skims	<ITER>_TRNAM_BM.SKM <ITER>_TRNOP_BM.SKM	Binary

Table 51 TAZ/Bus Fare Zone Equivalency File Format Description (TAZFRZN.ASC)

Columns	Format	Field Description
Zonal data (All lines in the file)		
1-8	I4	TAZ Number (1-3,675)
9-16	I4	1st Bus fare zone 1 (currently numbered 1 to 21)
17-24	I4	2nd Bus fare zone 2 (currently numbered 1 to 21)
57-64	I8	Jurisdiction code
65-72	I8	P discount
73-80	I8	A discount
Station data (first 150 lines of the file only)		
1-8	I4	Metrorail Station No. (1-150)
41-48	I4	1st Bus Fare Zone associated with Metro Station (currently numbered 1 to 21)
49-56	I4	2nd Bus Fare Zone associated with Metro Station (currently numbered 1 to 21)

As shown in Table 51 above, the TAZ/Bus Fare Zone Equivalency File (TAZFRZN.ASC) essentially contains two look-up tables: the zonal data table includes all lines in the file, while the station data table includes only the first 150 lines of the file. Both look-up tables use Columns 1-8 as the index column, which represents TAZ Number (1-3675) for the zonal data and represents Station Number (1-150) for the station data. Station information contained in Columns 41-48 and 49-56 are populated in only the first 150 lines of the file (zeros are used as placeholders for Lines 151-3675).

17.2 Application Details

The purpose of transit fare process is to develop a zonal matrix containing total transit costs as expressed in 2007 cents. The core components of the transit fare process are two scripts: *MFARE1.S* which develops Metrorail station-to-station fares and *MFARE2.S* which develops zone-to-zone transit fares using the *MFARE1.S* output.   Twenty-two fare matrices are developed sub-mode, time period, and access type, specifically:

- Four sub-modes (Bus Only Metrorail only, Metrorail/ Bus, and Commuter Rail) by;
- Two time periods (AM, off-peak), by;
- Three access types (Walk, PNR, and KNR)

Since commuter rail access is distinguished by walk and auto access only, 22 matrices are developed (instead of 24 which is implied above).

The fare process is executed with a batch file named *Transit_Fare.bat*. The batch file calls four scripts that are used to formulate the zone-to-zone transit fares for each market:

- *PrefarV23.s*: This script reads a zonal transit walk area file (NLWalkPct.txt) which includes walk areas pertaining to Metrorail stations only. It also reads an equivalency file (TAZFRZN.ASC) that equates TAZs to bus fare zones and Metrorail station numbers to bus fare zones. The program essentially merges the Metrorail walk percent information into the zonal equivalency file. The resulting file is named fare_a2.asc. This file is called by the MFARE2.S script and is needed for the zonal transit fare calculation. This script is also used to develop the zonal parking costs that are input into the mode choice model.

- *Metrorail_skims.s*: This script reads a Metrorail link and node file, and then develops Metrorail station-to-station distance skims. The file is need for the Metrorail station-to-station fare calculation.
- *MFARE1.S*: This script calculates the Metrorail station-to-station fares for AM and off-peak periods. The script reads in a fare parameter file that is consistent with WMATA's Metrorail fare policy (tariff.txt), station coordinates (MFARE1.A1), and a station discount file (MFARE1_STA_DISC.ASC). The script writes two text files containing Metrorail fares: AM_Metrorail_Fares.txt and OP_Metrorail_Fares.txt.
- *MFARE2.S*: This script calculates the total transit fare between TAZs for AM and off-peak periods. The script reads in several files:
  - The Metrorail station-to-station fares developed by MFARE1.s,
  - tarrif.txt (transit fare policy parameters contain rail-to-bus discounts)
  - TRN_Deflator.txt (the transit deflation factor)
  - Fare_a2.asc (file containing zonal walk percentages to Metrorail stations
  - BUSFAREAM/OP.ASC: AM and off-peak bus and commuter rail fares between bus fare policy zones. TPB currently uses 21 bus fare zones for the region. While most TAZs fall into a single bus policy zone, the fare calculation also accounts for the possibility that a single TAZ may be straddle 2 bus policy zones
  - Zonal skim files containing Metrorail on/off stations (*.STA) and in-vehicle travel times by transit mode (*.SKM). A set of transit skims must exist for each of the 22 transit paths.

The transit fare files are written to 22 binary file (*.FAR) each containing one table (total transit fare in 2007 cents). The batch file calls four additional scripts (*Assemble_Skims_??.S*) which are used to consolidate the 22 binary fare files into four files associated with each sub-mode. The consolidated files are subsequently used as inputs to the mode choice model.

The fare construction process between zonal pairs essentially consists of blending the Metrorail station-to-station fares with the bus-zone-to-bus-zone fares. The consideration of Metrorail fares is dependent upon individual path characteristics, i.e., whether or not the Metrorail in-vehicle time is greater than zero. If the path is not Metrorail-related, then the fare is developed from the bus fare matrix input. If the path is Metrorail-related, then the transit fare is based on the Metrorail station-to-station fare (from MFARE1), bus access and/or egress fares developed from the bus fare matrix, zonal Metrorail walk potential, and the Rail-to-Bus policy discount. The MFARE2 computation may be explained as a series of four discrete conditions.

Condition 1: Non-Metrorail related path / Single bus fare zone origin to Single bus fare destination zone

Transit fare = Bus Fare(bi1/bj1)

Condition 2: Non-Metrorail related path / Single bus fare zone origin to Double bus fare destination zone

Transit fare = [(Bus Fare(bi1/bj1) + Bus Fare(bi1/bj2)] / 2.0

Condition 3: Non-Metrorail related path / Double bus fare zone origin to Double bus fare destination zone

Transit fare = [(Bus Fare(bi1/bj1) + Bus Fare(b i1/bj2) + (Bus Fare(b i2/bj1) + Bus Fare(b i2/bj2)] / 4.0

Condition 4: Metrorail related paths

Transit Fare = (Bus Access fare * (1.0-Origin Metrorail walk Pct.)) + Metrorail fare(si/sj) +
(Bus Egress fare * (1.0-Destin. Metrorail walk Pct.))

Bus Access Fare **Single** bus fare zone to **Single** Metrorail bus fare zone =

Bus Fare(bi1/mi1) – 0.5 Rail-Bus Discount

Bus Access Fare **Single** bus fare zone to **Double** Metrorail bus fare zone =

Min[Bus Fare(bi1/mi1) , Bus Fare(bi1/mi2)] – 0.5 Rail-Bus Discount

Bus Access Fare **Double** bus fare zone to **Single** Metrorail bus fare zone =

[Bus Fare(bi1/mi1) + Bus Fare(bi2/mi1)]/2.0 – 0.5 Rail-Bus Discount

Bus Access Fare **Double** bus fare zone to **Double** Metrorail bus fare zone =

[Min[Bus Fare(bi1/mi1) , Bus Fare(bi1/mi2)] + Min[Bus Fare(bi2/mi1) , Bus Fare(bi2/mi2)]]/2.0 – 0.5 Rail-Bus Discount

Bus egress fares are calculated in the same way that bus access fares are calculated. A fare discount is applied to the fare calculation before it is written out to the binary output.

18 Demographic Submodels

Demographic submodels are applied within the *Trip_Generation.bat* batch file using the *Demo_Models.s* Cube Voyager script (see page A-6 of Appendix A). This script applies the three demographic submodels that are run prior to trip generation: household size, household income, and vehicle availability (see Chapter 3 of the calibration report for more details). The inputs to the model are zonal land use data (zone.dbf), data about area types (areaType_File.dbf), and information about the accessibility to jobs via transit. The zone.dbf file contains zonal households, population, jurisdiction code, and income index, as well as the household size and household income submodels (in the form of lookup tables). The households in each TAZ are then allocated to a household size group (1, 2, 3, or 4+) and an income group (<50K, 50K-100K, 100K-150K, or 150+K).

Next, the *Demo_Models.s* reads in the number of jobs accessible by AM Metrorail and Bus/Metrorail service within 45 minutes for each TAZ (see Table 48). This information along with household size, household income, area type, and the DC dummy variable are used to allocate households to the four vehicle ownership categories (0, 1, 2, or 3+).

Then, a file is produced, for each of the four income levels, which contains the number of households by household size and vehicle availability. These files are later used in trip generation. Lastly, the script accumulates the households by area type and prints out the following summaries located in the <ITER>_Demo_Models.txt:

- Regional Households by Size and Income Summary
- Jurisdictional Households by Size
- Jurisdictional Households by Income
- Regional Households by Vehicles Available and Size Summary
- Regional Households by Vehicles Available and Income Summary
- Jurisdictional Households by Vehicles Available
- Estimated Households by Size Level by Area Type
- Estimated Households by Income Level by Area Type
- Estimated Households by Vehicle Availability Level by Area Type

Process inputs and outputs are shown in Table 52 and Table 53.

Table 52 Inputs to the Demographic Models

Zonal Land Use File	Inputs\zone.dbf	DBF
Zonal Area Type File	AreaType_File.dbf	DBF
Transit Accessibility File (Metrorail only and Bus & Metrorail service)	<ITER>_AM_WK_MR_JOBACC.dbf <ITER>_AM_DR_MR_JOBACC.dbf <ITER>_AM_WK_BM_JOBACC.dbf <ITER>_AM_DR_BM_JOBACC.dbf	DBF

Note: <ITER> =PP, i1…i4

Table 53 Outputs of the Demographic Models

Zonal HHs of Income Level 1, Stratified by Size and Vehicle Avail.	HHI1_SV.txt	Text
Zonal HHs of Income Level 2, Stratified by Size and Vehicle Avail.	HHI2_SV.txt	Text
Zonal HHs of Income Level 3, Stratified by Size and Vehicle Avail.	HHI3_SV.txt	Text
Zonal HHs of Income Level 4, Stratified by Size and Vehicle Avail.	HHI4_SV.txt	Text
Interim Output: Zonal Households stratified by Income Level, household Size, and vehicle available (64 cross-classes)	<iter> _Demo_Models_HHbyISV.dbf	DBF

19 Trip Generation

19.1 Control/Support File(s):

Trip_Generation.s, Trip_Generation_Summary.s, Truck_Com_Trip_Generation.s

19.2 Application Details:

Trip generation is executed within the Trip_Generation.bat batch file using three Cube Voyager scripts: *Trip_Generation.s*, *Trip_Generation_Summary.s*, and *Truck_Com_Trip_Generation.s* (as shown on page A-6 of Appendix A). The inputs to the Trip_Generation.bat batch file are shown in Table 54.

Table 54 Inputs to trip generation

Zonal land use file	zone.dbf	DBF
Zonal Area Type File	AreaType_File.dbf	DBF
Zonal HHs stratified by income level, HH size, & vehs available	<iter>_Demo_Models_HHbyISV.dbf	DBF
Zonal GIS variable file	GIS_variables.dbf	DBF
Trip production rates	weighted_trip_rates.dbf	DBF
External Production and Attraction File	Ext_PsAs.dbf	DBF
Non-motorized trip production share model coefficients	NMPrates.dbf	DBF
Non-motorized trips Attraction share model coefficients	NMArates.dbf	DBF
Trip attraction rates	AttrRates.dbf	DBF
HB income shares	HBINCRAT.dbf	DBF
Consolidated zonal land use file	TripGen_LUFile.dbf	DBF
Truck and commercial vehicles trip rates	support\truck_com_trip_rates.dbf	DBF
Zonal access verification file	Skimtot<ITER>.txt	Text
	JurCore.dbf	DBF

The *Trip_Generation.s* script calculates zonal trip productions and attractions. The *Trip_Generation_Summary.s* summarizes the demographic information and the trip ends by jurisdiction. *The Truck_Com_Trip_Generation.s* produces trip ends for commercial vehicles and trucks.

The *Trip_Generation.s* script is very long (almost 1,500 lines). Figure 29 presents an outline or pseudo code of the steps in the trip generation script. The script has three phases, as indicated in the figure. There are a few points to note: **First**, the program is applied to compute zonal initial trip productions and (unscaled) zonal trip attractions. Attraction scaling is performed later, in the "*Prepare_Internal_Ends.s*" script. **Second**, the program makes sparing use of two sets of adjustments: jurisdiction level adjustments (end of phase 1) and area-type level adjustments (phases 1 and 2). The model does not make use of any "special generators" (other than the truck trip generation phase, where special generator TAZs are identified) and the model does not make use of zone-level adjustments, which are used in some models and are usually referred to production modification factors ("p-mods") and attraction modification factors ("a-mods").[91]

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[91] See, for example, William W. Mann, "TRIMS - Four Steps: One Execution," *ITE Journal* 52, no. 12 (December 1982): 16.

```
Phase 1: Read in input data and trip rates and establish parameters

    1. Read input files into arrays.  The inputs include:  zonal land activity, external Ps/As, zonal area types, zonal HHs stratified by Inc./Size/ VA., zonal GIS variables, trip production rates, trip attraction rates, and income attraction shares by HB purpose area type
    2. Establish output files:
        a. Report file (%_iter_%_Trip_Generation.txt')
        b. Computed Zonal trip productions ('%_iter_%_Trip_Gen_Productions_Comp.dbf')
        c. Computed Zonal trip Attractions ( '%_iter_%_Trip_Gen_Attractions_Comp.dbf')
    3. Establish Area-Type trip end (motorized, non-motorized) factors by purpose and area type
    4. Establish External trip parameters (Share of ext. NHB travel that is NHW and NHO, auto occupancies of external autos, by purpose)
    5. Establish Jurisdictional trip end factors by purpose

Phase 2: Compute Initial Trip Productions and Attractions

    1. Loop through each internal zone
        a. Apply trip production rates to stratified HHs by income, size, vehav. To arrive at total Ps
        b. Computed non-motorized production shares by purpose and area type
        c. Apply non-motorized shares and adjustment parameters to total Ps to arrive at final motorized & non-motorized Ps
        d. Summarize and write out internal computed trip Ps stratified by income
        e. Apply trip attraction rates to land activity
        f. Computed non-motorized attraction shares by purpose and area type
        g. Apply non-motorized shares and adjustment parameters to total As to arrive at final motorized & non-motorized As
        h. Disaggregate total final attractions to income strata, by purpose and area type

       End internal zone loop

    2. Loop through each internal zone: Summarize and write out internal computed attractions by income
    3. Loop through each external zone
        a. Read external auto driver trip Ps and As
        b. Convert external vehicle Ps and As to auto person trips based on car occ. parameters
        c. Disaggregate total external NHB auto persons among NHW and NHO based on parameters
        d. Write out external Ps and As

       End external zone loop

Phase 3: Print out regional totals of computed trip productions/attractions
```

Figure 29 Outline/pseudo code for *trip_generation.s*

Trip_generation.s begins, in phase 1, by reading the zonal land use (Zone.dbf); the area type file (AreaType_File.dbf); external trip productions and attractions (EXT_PsAs.dbf, described in Table 55); zonal households stratified by income, size, and vehicles available (<iter>_Demo_Models_HHbyISV.dbf);

zonal walkability factors (GIS_variables.dbf); trip production rates (weighted_trip_rates.dbf); non-motorized production model coefficients (NMPrates.dbf); non-motorized attraction model coefficients (NMArates.dbf); trip attraction model coefficients (AttrRates.dbf); and income shares for home-based trips (HBINCRAT.dbf).

The zonal GIS variable file (GIS_variables.dbf) contains a number of built-environment variables that describe the walkability of an area, such as the number of 3-legged intersections per TAZ, the number of cul-de-sacs per TAZ, the number of street blocks per TAZ, and the number of Census blocks per TAZ. Although the GIS file contains a number of variables, the trip generation process uses only one: **the number of street blocks per TAZ ("BLOCKS")**.[92] Since these built-environment variables are intended to deal with issues of walkability, it is best to use a detailed street network when calculating these metrics (as opposed to simply using the highway network itself, which is quite coarse). In our case, we used NAVTEQ's NAVSTREETS Street Data[93] (for which COG pays a license fee) and the work was performed in 2010 by COG/TPB staff.[94] Note that NAVTEQ is now known as HERE. A block is defined as a 2-dimensional area (polygon) that is completely enclosed by a series of NAVTEQ street segments. Prior to forming blocks, the following segments were removed from the NAVTEQ street network:

- Street segments with no name (ST_NAME=blank), since these are not actually street segments;
- "Major highways" (NAVTEQ functional class [FUNC_CLASS] equal to 1 or 2).[95]
- Ramps (RAMP = Y)

Figure 30 shows an example of the seven blocks that are contained within TAZ 283 (Union Station), as defined by NAVTEQ street segments (omitting major highways and ramps, as discussed above).

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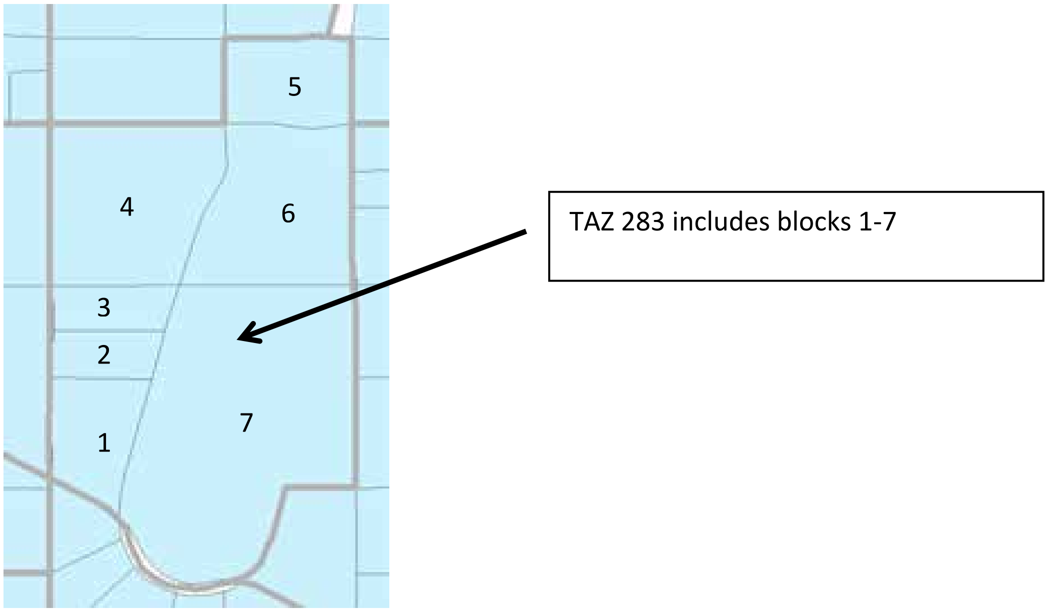
[92] It has been found that areas with a higher density of street blocks are more walkable.

[93] NAVTEQ, "NAVTEQ's NAVSTREETS Street Data, Reference Manual v3.2," Proprietary and Confidential (Chicago, Illinois: NAVTEQ, April 1, 2009).

[94] Mary Martchouk to Mark S. Moran, "Developing GIS Walkability Measures," Memorandum, June 2, 2010, 6–7.

[95] NAVTEQ, "NAVTEQ's NAVSTREETS Street Data, Reference Manual v3.2", p. 4-5.



TAZ 283 includes blocks 1-7

Figure 30 Example of seven NAVTEQ street blocks within TAZ 283 (Union Station)

In the trip generation script (*Trip_Generation.s*), the number of blocks per TAZ is then converted to a density measure, specifically the floating 0.5-mile block density for each TAZ (BLOCKS05, lines 180-215 of Trip_Generation.s). In the travel model, it is assumed that the block density has an effect on non-motorized trip productions and attractions **only for area types 1 and 2** (See, for example, Tables 27-29 of the calibration report for non-motorized productions and Tables 30-32 for non-motorized attractions, where the floating 0.5-mile block density is called BLKDEN05).[96]

It is assumed that the model user will rarely change the value of BLOCKS (or its derivative, BLKDEN05) when running the model (i.e., the modeler will freeze the base-year levels of block density). This is analogous to the way that household income distributions are generally frozen in the model. The exception to this rule is if the modeler believes that the street network in an area will become denser or sparser, then the modeler can make appropriate manual adjustments to the zonal BLOCK variable.

The trip generation process also reads external trip ends from a file (Ext_PsAs.dbf) that is developed exogenously. The data items are shown in Table 55. The *Trip_Generation.s* script writes out an intermediate dBase file containing land activity, one-mile "floating" land use density, one-half mile "floating" block density, and jurisdictional and area type codes. The file is a consolidation of input data from various zone files and derived variables.[97] The specific data elements are shown on Table 56. Note that, in the file Ext_PsAs.dbf (Table 55), the last two variables are medium truck external-internal (X-I) trip ends (MTK_XI) and heavy truck external-internal (X-I) trip ends (HTK_XI), but there are no

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[96] Milone et al., "Calibration Report for the TPB Travel Forecasting Model, Version 2.3," 4–17 to 4–20.
[97] Floating densities are calculated using the centroids of the TAZs and street blocks, with a point buffer around the centroid with the given radius (0.5 mile or 1.0 mile).

corresponding variables for the internal-external movements (e.g., MTK_IX and HTK_IX). This is because it is assumed that the two movements (XI and IX) are the same.

Table 55 External Production and Attraction File (Ext_PsAs.dbf)

Variable	Description
`TAZ`	External station no. (3676-3722)
`FACILITY`	Facility route no./name
`AAWT_CTL`	Average annual weekday traffic count (observed or forecasted)
`CNTFTR`	(unused)
`AUTO_XI`	Auto driver external-internal (X-I) trip ends
`AUTO_IX`	Auto driver internal-external (I-X) trip ends
`AUTO_XX`	Auto driver through (X-X) trip ends
`CV_XX`	Commercial vehicle through (X-X) trip ends
`HBW_XI`	HBW external-internal (X-I) trip ends
`HBS_XI`	HBS external-internal (X-I) trip ends
`HBO_XI`	HBO external-internal (X-I) trip ends
`NHB_XI`	NHB external-internal (X-I) trip ends
`CV_XI`	Commercial vehicle external-internal (X-I) trip ends
`HBW_IX`	HBW internal-external (I-X) trip ends
`HBS_IX`	HBS internal-external (I-X) trip ends
`HBO_IX`	HBO internal-external (I-X) trip ends
`NHB_IX`	NHB internal-external (I-X) trip ends
`CV_IX`	Commercial vehicle internal-external (I-X) trip ends
`TRCK_XX`	Truck through (X-X) tip ends (medium and heavy truck)
`TRCK_XI`	Truck external-internal (X-I) trip ends (medium and heavy truck)
`TRCK_IX`	Truck internal-external (I-X) trip ends (medium and heavy truck)
`MTK_XI`	Medium truck external-internal (X-I) trip ends
`HTK_XI`	Heavy truck external-internal (X-I) trip ends

Source: Milone, R. (2011, July 1). Version 2.3 Exogenous Trip Files. Memorandum.

The one-mile floating density is then calculated for population and employment and a half-mile floating density is calculated for street blocks. These are saved in an intermediate file named TripGen_LUFile.dbf (Table 56). Then, the script calculates zonal trip productions based on demographic data and applies the non-motorized production model to the results. Motorized internal trips productions are then obtained by subtracting the estimated non-motorized trips. The output production file data items are shown on Table 57.

Table 56 Consolidated Zonal Land Use File

File Name	Variable Name	Description
TripGen_LUFile.dbf	TAZ	TAZ Number (1-3,722)
	HH	Number of house holds
	TOTPOP	Total Population
	TOTEMP	Total employment
	RETEMP	Retail employment
	NRETEMP	Non-retail employment
	OFFEMP	Office employment
	OTHEMP	Other employment
	INDEMP	Industrial employment
	HHPOP	House hold population
	GQPOP	Group quarter population
	LANDAREA	Land area (sq. mi.)
	POP_10	Number of population within one "floating" mile
	EMP_10	Number of employment within one "floating" mile
	AREA_10	Zonal Area within one "floating" mile
	POPDEN10	Population density within one "floating" mile
	EMPDEN10	Employment density within one "floating" mile
	ADISTTOX	Distance to the nearest external station
	BLOCKS05	Blocks within 0.5 mile "floating" blocks
	AREA05	Area within 0.5 mile "floating" blocks
	BLOCKDEN05	Block density within 0.5 mile "floating" blocks
	JURCODE	Jurisdiction code (0-23)
	ATYPE	Area Type (1-6)

Table 57 Computed zonal trip productions file (<iter>_Trip_Gen_Productions_Comp.dbf)

Variable Name	Description
TAZ	TAZ Number (1-3,722)
HBW_MTR_PS	Home-Based-Work motorized person trip productions
HBW_NMT_PS	Home-Based-Work non-motorized person trip productions
HBW_ALL_PS	Home-Based-Work motorized and non-motorized person trip productions
HBWMTRP_I1	Home-Based-Work Motorized person trip productions, Income level 1
HBWMTRP_I2	Home-Based-Work Motorized person trip productions, Income level 2
HBWMTRP_I3	Home-Based-Work Motorized person trip productions, Income level 3
HBWMTRP_I4	Home-Based-Work Motorized person trip productions, Income level 4
HBS_MTR_PS	Home-Based-Shop motorized person trip productions
HBS_NMT_PS	Home-Based-Shop non-motorized person trip productions
HBS_ALL_PS	Home-Based-Shop motorized and non-motorized person trip productions
HBSMTRP_I1	Home-Based-Shop Motorized person trip productions, Income level 1
HBSMTRP_I2	Home-Based-Shop Motorized person trip productions, Income level 2
HBSMTRP_I3	Home-Based-Shop Motorized person trip productions, Income level 3
HBSMTRP_I4	Home-Based-Shop Motorized person trip productions, Income level 4
HBO_MTR_PS	Home-Based-Other motorized person trip productions
HBO_NMT_PS	Home-Based-Other non-motorized person trip productions

HBO_ALL_PS	Home-Based-Other motorized and non-motorized person trip productions
HBOMTRP_I1	Home-Based-Other Motorized person trip productions, Income level 1
HBOMTRP_I2	Home-Based-Other Motorized person trip productions, Income level 2
HBOMTRP_I3	Home-Based-Other Motorized person trip productions, Income level 3
HBOMTRP_I4	Home-Based-Other Motorized person trip productions, Income level 4
NHW_MTR_PS	Non-Home-Based Work-Related motorized person trip productions
NHW_NMT_PS	Non-Home-Based Work-Related non-motorized person trip productions
NHW_ALL_PS	Non-Home-Based Work-Related motorized & non-motorized person trip productions
NHO_MTR_PS	Non-Home-Based Non-Work-Related motorized person trip productions
NHO_NMT_PS	Non-Home-Based Non-Work-Related non-motorized person trip productions
NHO_ALL_PS	Non-Home-Based Non-Work-Related motorized & non-motorized person trip productions

Next, the zonal trip attractions are calculated by applying the attraction trip models to the land use file. Non-motorized trip attractions are then determined and subtracted from the total trip attractions. Similar to productions, attractions are multiplied by an adjustment factor (Appendix A of the Calibration Report) and disaggregated by income level. The computed trip attractions are then written out to <ITER>_Trip_Gen_Attractions_Comp.dbf file. The final trip attractions are saved in the <ITER>_Trip_Gen_Attractions_Final.dbf described in Table 58.

Table 58 Computed zone trip attractions file (<iter>_Trip_Gen_Attractions_Comp.dbf)

Variable Name	Description
TAZ	TAZ Number (1-3,722)
HBW_MTR_AS	Home-Based-Work motorized person trip Attractions
HBW_NMT_AS	Home-Based-Work non-motorized person trip Attractions
HBW_ALL_AS	Home-Based-Work motorized and non-motorized person trip Attractions
HBWMTRA_I1	Home-Based-Work motorized person trip Attractions, Income level 1
HBWMTRA_I2	Home-Based-Work motorized person trip Attractions, Income level 2
HBWMTRA_I3	Home-Based-Work motorized person trip Attractions, Income level 3
HBWMTRA_I4	Home-Based-Work motorized person trip Attractions, Income level 4
HBS_MTR_AS	Home-Based-Shop motorized person trip Attractions
HBS_NMT_AS	Home-Based-Shop non-motorized person trip Attractions
HBS_ALL_AS	Home-Based-Shop motorized and non-motorized person trip Attractions
HBSMTRA_I1	Home-Based-Shop motorized person trip Attractions, Income level 1
HBSMTRA_I2	Home-Based-Shop motorized person trip Attractions, Income level 2
HBSMTRA_I3	Home-Based-Shop motorized person trip Attractions, Income level 3
HBSMTRA_I4	Home-Based-Shop motorized person trip Attractions, Income level 4
HBO_MTR_AS	Home-Based-Other motorized person trip Attractions
HBO_NMT_AS	Home-Based-Other non-motorized person trip Attractions
HBO_ALL_AS	Home-Based-Other motorized and non-motorized person trip Attractions

HBOMTRA_I1	Home-Based-Other motorized person trip Attractions, Income level 1
HBOMTRA_I2	Home-Based-Other motorized person trip Attractions, Income level 2
HBOMTRA_I3	Home-Based-Other motorized person trip Attractions, Income level 3
HBOMTRA_I4	Home-Based-Other motorized person trip Attractions, Income level 4
NHW_MTR_AS	Non-Home-Based Work-Related motorized person trip Attractions
NHW_NMT_AS	Non-Home-Based Work-Related non-motorized person trip Attractions
NHW_ALL_AS	Non-Home-Based Work-Related motorized & non-motorized person trip Attractions
NHO_MTR_AS	Non-Home-Based Non-Work-Related motorized person trip Attractions
NHO_NMT_AS	Non-Home-Based Non-Work-Related non-motorized person trip Attractions
NHO_ALL_AS	Non-Home-Based Non-Work-Related motorized & non-motorized person trip Attractions

The *Trip_Generation_Summary.s* creates a summary text file, <ITER>_Trip_Generation_Summary.txt, which includes the following tables:

- Land Activity by Jurisdiction
- Land Activity by Area Type
- Motorized Trip Productions by Purpose and Jurisdiction
- Motorized Trip Productions per Household by Purpose and Jurisdiction
- Motorized Trip Productions by Purpose and Area Type
- Non-Motorized Trip Productions by Purpose and Jurisdiction
- Non-Motorized Trip Productions by Purpose and Area Type
- Home-Based Motorized Trip Productions by Purpose, Income, and Jurisdiction
- Home-Based Motorized Trip Productions by Purpose, Income, and Area Type
- Motorized Trip Attractions by Purpose and Jurisdiction
- Motorized Trip Attractions per Job by Purpose and Jurisdiction
- Motorized Trip Attractions by Purpose and Area Type
- Non-Motorized Trip Attractions by Purpose and Jurisdiction
- Non-Motorized Trip Attractions by Purpose and Area Type
- Home-Based Motorized Trip Attractions by Purpose, Income, and Jurisdiction
- Home-Based Motorized Trip Attractions by Purpose, Income, and Area Type

The Truck_Com_Trip_Generation.s script reads in the zonal land use file (Zone.dbf), the area type file (AreaType_File.dbf), external trip productions and attractions (EXT_PsAs.dbf), demographic model outputs (%_iter_%_Demo_Models_HHbyISV.dbf), truck and commercial trip model coefficients (truck_com_trip_rates.dbf), and the zonal access verification file (Skimtot<ITER>.txt). For the list of inputs, see Table 54. The script then uses the truck and commercial trip model coefficients and the land use data to calculate medium and heavy truck and commercial vehicle zonal trips. After an adjustment factor is applied, these are written out to a ComVeh_Truck_Ends_<ITER>.dbf file described in Table 59.

Table 59 Truck and commercial vehicles trip ends (<iter>_ComVeh_Truck_Ends.dbf)

Variable Name	Description
TAZ	TAZ number (1-3722)
COMM_VEH	Commercial vehicle trip ends
MED_TRUCK	Medium truck trip ends
HVY_TRUCK	Heavy truck trip ends
ICOMM_VEH	Commercial vehicle trip ends (internal only)
IMED_TRUCK	Medium truck trip ends (internal only)
IHVY_TRUCK	Heavy truck trip ends (internal only)

The script also generates a summary text file- <ITER>_Truck_Com_Trip_Generation.txt, which includes the following tables:

- Regional Total Truck and Commercial Trip-Ends
- Truck and Commercial Vehicle Internal Trip Totals by Area Type
- Truck and Commercial Vehicle Internal Trip Totals by Jurisdiction

The trip generation process is currently applied to produce computed trip productions and computed (un-scaled) attractions by trip purpose. The computed productions and attractions are provided explicitly as motorized and non-motorized. The Home-Based motorized Ps and As are further stratified by income level. In prior trip generation versions, an Internal to External production share model was employed to extract the external travel component of total trip productions (of I-X trips). The extraction was necessary because external trip ends are prepared exogenously based on projected traffic counts. The potential problem with an I-X extraction model is that there is no guarantee that the model would yield I-X productions already developed exogenously at the external station level. It was ultimately decided that the approach for treating external trips in the generation and distribution process, and the approach for trip attraction scaling would be modified to ensure that I-X trips would be better preserved.

The modified process now involves the following Trip Generation and Trip distribution steps:

1. *Trip_Generation.s*: Computed trip productions and computed trip attractions are developed by purpose and mode (motorized and non-motorized). Trip attraction scaling is not undertaken.
2. *Prepare_Ext_Auto_Ends.s, Prepare_Ext_ComTruck_Ends.s*: External trip-ends (Ps and As) are prepared.
3. *Trip_Distribution_External.s*: External trip-ends are distributed, resulting in external trip tables, by purpose.
4. *Prepare_Internal_Ends.s*: Final internal trip-ends are computed as follows:
    - External trip ends (I-X) trips and (X-I) trips-ends are summarized by purpose from the external trip matrices developed in Step 3
    - The zonal I-X trip ends are subtracted from the motorized trip productions computed in Step 1. This results in final motorized productions. Non-motorized productions are unaffected.

- Scaling factors for internal trip attractions are computed by purpose. The factor is[98]

  IntAttrScaleFtr = ("Final" Intl P's + Extl. P's – Extl. A's) / (Intl. "Computed" A's)

  The above factor is applied to both motorized and non-motorized trip attractions

5. *Trip_Distribution_Internal.s*: The final internal P's and balanced A's are run through trip distribution. The resulting internal trips are combined with the external trips developed in step three.

While this process is slightly more complicated than the prior approach it better ensures that external trips developed exogenously are preserved through the trip distribution stage.

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[98] This equation was developed by Bill Mann in the early 1990s.

20 Trip Distribution

20.1 Overview

The trip distribution process (shown on page A-7 of Appendix A) is invoked by the *Trip_Distribution.bat* file. The input and output files are listed in Table 60 and Table 61. As stated in the calibration report, the gravity model is doubly-constrained for all five trip purposes.

The trip distribution process entails five Cube Voyager steps that involve two separate trip distribution procedures: one to distribute external auto person trips by purpose, and another to distribute internal motorized person trips by purpose. As explained in the trip generation chapter, this dual distribution procedure enables external trips (I-X) trips to be more precisely preserved at the station level compared to the prior trip generation/distribution approach.

Table 60 Inputs to trip distribution

Item	**Filename**	**Format**
Computed zonal motorized trip productions	<iter>_Trip_Gen_Productions_Comp.dbf	dBase
Computed zonal motorized trip attractions (un-scaled)	<iter>_Trip_Gen_Attractions_Comp.dbf	dBase
Computed zonal commercial, truck trip ends (Ps, As)	<iter>_ComVeh_Truck_Ends.dbf	dBase
AM highway skims	<PreIter>_AM_SOV.SKM	Binary
OP highway skims	<PreIter>_OP_SOV.SKM	Binary
AM Walk Access Metrorail-only total travel time	<iter>_AM_WK_MR.ttt	Binary
AM Drive Access Metrorail-only total travel time	<iter>_AM_DR_MR.ttt	Binary
OP Walk Access Metrorail-only total travel time	<iter>_OP_WK_MR.ttt	Binary
OP Drive Access Metrorail-only total travel time	<iter>_OP_DR_MR.ttt	Binary
Toll-time equiv. file (by Income/purpose)	Equiv_Toll_Min_by_Inc.s	Text
K-Factor matrices	HBW_K.mat, HBS_k.mat, … ,NHO_k.mat	binary
Friction factors	Ver23_F_Factors.dbf	dBase

Note: <ITER> =PP, i1, …, i4

Table 61 Outputs of trip distribution

Item	Filename	Format
HBW Motorized Psn. Trips (internal & external)	<iter>_HBW.PTT	Binary
HBS Motorized Psn. Trips (internal & external)	<iter>_HBS.PTT	Binary
HBO Motorized Psn. Trips (internal & external)	<iter>_HBO.PTT	Binary
NHW Motorized Psn. Trips (internal & external)	<iter>_NHW.PTT	Binary
NHO Motorized Psn. Trips (internal & external)	<iter>_NHO.PTT	Binary
Commercial Vehicle Trips (internal & external)	<iter>_Commer.PTT	Binary

Medium Truck Trips (internal & external)	<iter>_MTruck.PTT	Binary
Heavy Truck Trips (internal & external)	<iter>_HTruck.PTT	Binary
HBW Motorized Psn. Trips (internal only)	<iter>_HBW_NL.PTT	Binary
HBS Motorized Psn. Trips (internal only)	<iter>_HBS_NL.PTT	Binary
HBO Motorized Psn. Trips (internal only)	<iter>_HBO_NL.PTT	Binary
NHW Motorized Psn. Trips (internal only)	<iter>_NHW_NL.PTT	Binary
NHO Motorized Psn. Trips (internal only)	<iter>_NHO_NL.PTT	Binary

20.2 Application Details

The Trip Distribution process is executed with the batch file named, *Trip_Distribution.bat*. Five Cube Voyager scripts are used to carry out the process.

The first two scripts, *Prepare_Ext_Auto_Ends.s* and *Prepare_Ext_ComTruck_Ends.s* read the computed zonal Productions and Attraction resulting trip generation and prepares trip ends that are suitable for applying trip distributing for external Ps and As only.

The *Trip_Distribution_External.s* script executes the distribution of external trip-ends, resulting in external trip tables, by purpose. The script also calculates zonal impedances that are used in both the distribution of external and internal trips.

The trip distribution process uses different LOS impedances measures, depending on trip purpose. Work (HBW) trips are distributed using AM peak travel impedances while midday (MD) impedances are used for all remaining purposes.

The script first prepares zonal highway terminal times, which are based on the zonal area type. The terminal times, which represent the time needed to park and un-park a vehicle, range from 1 minute in the least developed areas to 5 minutes for highly developed areas. The terminal times are then added to the over-the-network highway travel time skims. Next, composite impedance tables are developed combining transit time and highway times, based on the formula shown in Equation 2:

Equation 2 Composite time

$$CT_i = \frac{1}{\frac{1}{HT + TollT_i} + \frac{P_i}{TT}}$$

where

CT_i = Composite time for income level i
HT = Congested highway time (minutes), including terminal time
$TollT_i$ = Time equivalent (minutes)of tolls associated with the minimum-time path for income i
P_i = Regional transit share of income i for the trip purpose
TT = Metrorail-related transit time (min.), including in-vehicle and out-of-veh. time components

The basis of the TollT_i term calculation is specified in Table 62. The table indicates the average time valuation, in minutes, per year-2007 dollar, that is assigned to a toll value by income level and trip type. The table indicates, for example, that a $1.00 toll equates to 8.7 minutes of travel time for a traveler in income level 1. More generally, the table indicates that travelers commuting to work are less sensitive to tolls than non-work-bound travelers because the time valuation of commuters is relatively high. The table also reflects the intuitive generalization that lower income travelers are more sensitive to tolls than the higher income travelers.

Table 62 Time Valuation (Minutes/2007$) by Purpose and Income Level

HH Income Quartile Range (1)	Assumed Mid-Point of HH Inc. Range	Hourly Rate per Worker (2)	2007 Time Valuation (Minutes per Dollar)	
			Work Trips (75% VOT)	Non-work (50% VOT)
$ 0 - $ 50,000	$25,000	$9.23	8.7	13.0
$ 50,000 - $ 100,000	$75,000	$27.70	2.9	4.3
$100,000 - $150,000	$125,000	$46.17	1.7	2.6
$150,000 +	$175,000	$64.64	1.2	1.9

Notes:

(1) Income groups based on 2007 ACS-based quartiles

(2) Hourly rate based on 1,920 annual hours/worker * 1.41 workers/HH = 2,707 hrs/HH

(3) Median 2007 annual HH income for the TPB modeled area is $84,280

Prepare_Internal_Ends.s reads the external trip tables created above, and summarizes the trip-ends from those trip tables. It also reads the internal trip-ends from the trip generation process. The script subtracts I-X trips from the total computed trip productions (by purpose), to arrive at "final" internal trip productions. An internal trip attraction trip scaling factor is next computed. The factor is computed by purpose as:

IntAttrScaleFtr = ("Final" Intl Ps + Extl. Ps – Extl. As)/ Intl. "Computed" As

The internal Ps and As in the above equation includes both motorized and non-motorized trips. A summary of the initial and final/scaled trip-ends is provided in a small text file named <iter>_Prepare_Internal_Ends.txt.

Trip_Distribution_Internal.s: The final internal Ps and scaled As are run through trip distribution. The resulting internal trips are combined with the external trips developed above. The trip distribution process produces complete (internal and external) trip tables by purpose and produces internal-to-internal (I-I) trip tables which will be inputs to the mode choice model later in the model stream. A complete set of jurisdictional trip tables by purpose is reported in a text file named <iter>_Trip_Distribution_Internal.tab.

21 Mode Choice

21.1 Travel modes represented in the mode choice model

As shown in Figure 31, the mode choice model in the Version 2.3 Travel Model was designed to have 15 choices, made up of the following modes:

- Three auto modes: Drive alone, shared ride 2 person, and shared ride 3+ person.
- Three transit access modes:
    - Drive to transit and park in a park-and-ride (PNR) lot;
    - Drive to transit and drop off passenger(s) at the kiss and ride (KNR) lot or station; and
    - Walk to transit.
- Four transit modes: Commuter rail, all bus, all Metrorail, and combined bus/Metrorail.

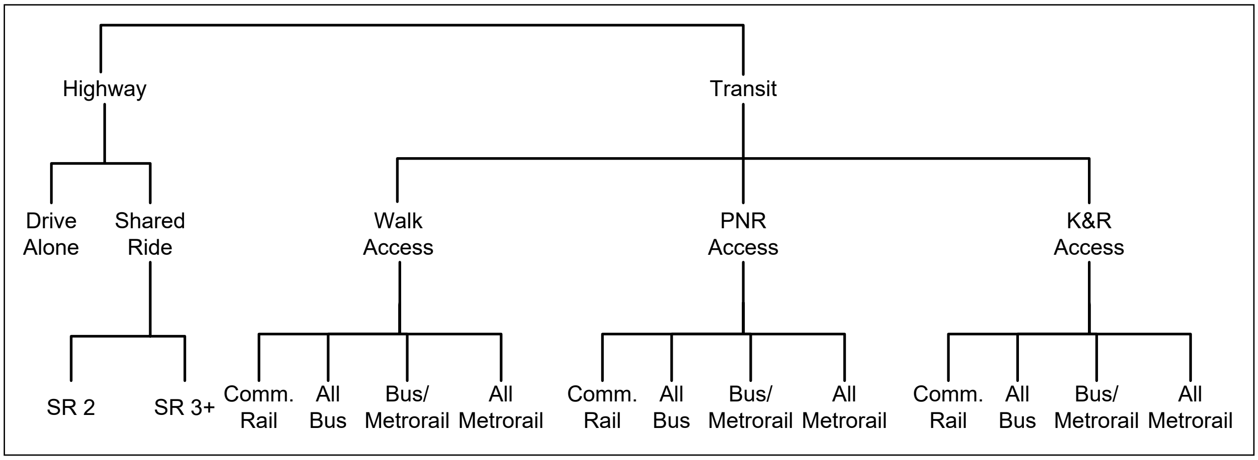

Figure 31 Designed nesting structure of the nested-logit mode choice model in the Version 2.3 travel model

* In model implementation, PNR and KNR access modes for commuter rail are combined into one choice, resulting in 14 choices, not 15.

Ref: "I:\ateam\nest_log\NestedChoice_Struct4.vsd"

Two important distinctions should be made. First, as per the design of AECOM, for the commuter rail mode, the model was implemented such that PNR and KNR commuter rail are combined as a single choice (in mode choice) or a single path (in path building), since, for commuter rail, the PNR- and KNR-access links are identical. Thus, instead of 12 access-mode/transit-mode choices, the model is implemented using 11 access-mode/transit-mode choices. Consequently, as implemented in the model, the mode choice model actually has 14 choices, not 15. This is difficult to portray in Figure 31, but is noted in a footnote on the figure. This combining of modes is also apparent in Table 67 ("Outputs from the AEMS mode choice application program").

Second, regarding the three auto modes: As discussed in the calibration report, the definition of high-occupancy vehicle (HOV) trips has changed, compared to the definition that was used in the Version 2.2 Travel Model. Previously, HOV trips coming out of the mode choice model referred to *only those that* *use HOV facilities for a substantial portion of their trip*. Similarly, in previous models, the definition of low-occupancy vehicle (LOV) included both drive-alone and carpools (provided the carpools did not use a preferential HOV facility). By contrast, in the Version 2.3 NLMC model, the term LOV refers to only the drive-alone trips. Similarly, HOV refers to all shared-ride 2 (2-person carpools) and shared-ride 3 (3+ person carpools), irrespective of whether they use an HOV facility or not.

21.1.1 Treatment of LRT, BRT, and streetcar

Note that the nesting structure of the TPB Version 2.3 NLMC model does not include branches for specialized transit modes, such as light-rail transit (LRT), bus rapid transit (BRT), and streetcar. From this, one might conclude that the mode choice model is not designed to deal with these special transit modes. In fact, the model is designed to deal with these special transit modes. This section of the report discusses how these modes are treated in both the mode choice model and the transit path skimming process that feeds the mode choice model.   This is the scheme that was developed by AECOM in 2004-2005 and has been retained by TPB staff. One of the underlying assumptions is that "premium" transit modes (e.g., Metrorail, commuter rail, LRT, BRT, and streetcar) will typically travel faster than buses, since they have one or more of these characteristics:

- A dedicated right-of-way, at least for part, if not all, of the route
- Traffic signal priority
- Superior acceleration/deceleration (compared to buses)

21.1.1.1 Network representation: LRT, BRT, and streetcar

In terms of network representation, LRT is typically coded as "mode 5." BRT and streetcar are coded as "mode 10," referred to in some parts of the model as the "new" mode. The thought is that LRT will travel mainly on its own grade-separated right-of-way (ROW), where it does not have to interact with road traffic. By contrast, it is assumed that streetcar will travel mostly in mixed traffic, i.e., it will share an at-grade right-of-way with road traffic. It is believed that AECOM chose to include BRT with streetcar, since although BRT will often include some grade-separated rights-of-way for the trunk-line portion of the route, the beginning and ending of the BRT route are likely to be in mixed traffic, making it more similar to the streetcar.

In cases where a travel demand modeler is coding a new transit line representing a "premium" transit mode,[99] the modeler must add "transit-only" links to the transit network to represent the new service, since the line requires a dedicated ROW which is not part of the highway network. In the past, one would have added these transit-only links to the rail link file (rail_link.bse). However, with the advent of TPB staff using an Esri geodatabase to manage the highway and transit networks, the rail_link.bse file no longer exists. For a modeler working at COG, one should add transit-only links directly into the highway/transit network geodatabase. For a modeler working external to COG (who will not have access

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[99] Such as Metrorail (Mode 3), commuter rail (Mode 4), LRT (Mode 5), and BRT/streetcar (Mode 10).

to the COGTools ArcGIS add-in for managing the geodatabase), one should modify the text *.tb files that are output from the *create_support_files.s* Cube Voyager script.

The "station file" (station.dbf) contains information about transit stations in the modeled area. More formally, the station file contains information about Metrorail stations, commuter rail stations, light rail stations, bus rapid transit stations/stops, streetcar stations/stops, express-bus bus stops, and park-and-ride (PNR) lots that serve these stations/stops. One must add Mode 5 and Mode 10 station nodes to the station file using a mode code of "L" for LRT/Mode 5 and "N" for New/BRT/streetcar/Mode 10. Mode 5 and 10 stations do not require a station centroid number,[100] though recent network documentation has designated the node number range of 7000-7999 (light rail/BRT PNR centroids), even though this range is not currently in use in the geodatabase.[101] Cube Voyager cannot combine headways for routes unless they are part of the same mode code, so, in cases where Mode 10 routes share a street segment with local bus (Mode 1), these two routes will not be represented with a combined headway.

21.1.1.2 Transit path building and skimming, mode choice, and transit assignment: LRT, BRT, and streetcar

In transit path building and skimming, mode choice, and transit assignment, the following two rules apply:[102]

- LRT: Mode 5 is treated like Metrorail (Mode 3)
- BRT: Mode 10 is treated like local bus (Modes 1, 6, & 8)

21.1.1.3 Fares: LRT, BRT, and streetcar

Fares for Mode 5 and Mode 10 are computed like those for local bus (Modes 1, 6, & 8).

21.1.1.4 Inclusion of LRT, BRT, and streetcar trips in trip tables

Following the mode choice step, the output trip table files (*.MTT) each contain 14 tables, as shown in Table 67. Any table that lists "MR" (Metrorail) actually includes both Metrorail and LRT, since Mode 5 [LRT] is treated like Metrorail (Mode 3) in transit path building/skimming, mode choice and transit assignment. Similarly, any table that lists "BU" (Bus) actually includes both bus and BRT/streetcar. The only way to get the actual breakout of the estimated level of LRT or BRT/streetcar travel is to look at the transit assignment results (keeping in mind that, although we assign all transit trips, we validated only Metrorail trips, and, at the current time, these are validated only to station groups, not to individual stations). So, after transit assignment, one is able to see how many trips/boardings/alightings occurred

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[100] Jain to Milone and Moran, "MWCOG Network Coding Guide for Nested Logit Model (First Draft: September 20, 2007; Updated February 2008 and October 2010)," 6.

[101] Meseret Seifu, Ronald Milone, and Mark Moran, "Highway and Transit Networks for the Version 2.3.66 Travel Model, Based on the 2016 CLRP and FY 2017-2022 TIP," Final Report (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, March 17, 2017), 17, https://www.mwcog.org/transportation/data-and-tools/modeling/model-documentation/.

[102] Jain to Milone and Moran, "MWCOG Network Coding Guide for Nested Logit Model (First Draft: September 20, 2007; Updated February 2008 and October 2010)," 10.

on a given LRT line, but, since we do not validate results at the LRT line level, model users are recommended to use caution when using these numbers.

21.1.2 Other issues relating to travel modes

Table 63 list the ten transit modes that are handled by the Version 2.3 mode choice model and lists the mode code used in the station file (station.dbf), which is an input to the *parker.s* script that is part of the transit_skim_all_modes.bat batch file (see Section 16, Transit Skim File Development). Note that the consolidated station file does not include bus stops, except for bus stops that have their own PNR lot (generally express bus service). Transit routes are represented in Cube Voyager's TRNBUILD module using the LINE command, which is usually placed in a *.LIN file or, using COG/TPB convention, in a MODE*.TB file (a "mode" file).

Table 63 Transit sub-modes represented in the Version 2.3 travel model

Mode #	Transit sub-mode	Mode code in station file
1	Local Metrobus	(not represented in the sta. file)
2	Express Metrobus	B
3	Metrorail	M
4	Commuter rail	C
5	Light rail transit (LRT)	L
6	Other local bus in the WMATA service area	(not represented in the sta. file)
7	Other express bus in the WMATA service area	B
8	Other local bus beyond the WMATA service area	(not represented in the sta. file)
9	Other express bus beyond the WMATA service area	B
10	Bus rapid transit (BRT) and street car	N (for "New" mode)

In addition, there are five non-transit modes that are used to access transit and make transfers to, from, and between transit services. These are detailed in Table 64.

Table 64 Transit Access and Transfer Links

Mode #	Link Type
11	Drive access, for both PNR and KNR (from the zone centroid to a transit stop node)
12	Walk transfer link (between transit services or to/from transit station)
13	Sidewalk link
14	Unused
15	Walk transfer link between PNR lot and transit station
16	Walk access (from the zone centroid to a transit stop node)

All the modes described in Table 63 and Table 64 can be used in the path-building process (see 16). If no prohibitions are imposed, path building assumes that transfers between all modes are possible. For example, a person could theoretically access Metrorail by driving (mode 11) to the station, use Metrorail (mode 3), and egress Metrorail by driving (mode 11) as well. When trips are in production-attraction format, as is the case for transit path-building and mode choice, a person cannot egress from a station and take a car. To prevent the foregoing behavior in the model, some limitations with regard to transfers need to be imposed. These are described in Table 65. The mode interchanges where transfers are prohibited are denoted by "Y".

Table 65 Transfer Prohibitions (No Transfer or NOX)

From	To Mode															
Mode	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	n	n	n	n	n	n	n	Y	Y	n	Y	n	n	n	Y	n
2	n	n	n	n	n	n	n	Y	Y	n	Y	n	n	n	Y	n
3	n	n	n	n	n	n	n	Y	Y	n	Y	n	n	n	Y	n
4	n	n	n	n	n	n	n	Y	Y	n	Y	n	n	n	Y	n
5	n	n	n	n	n	n	n	Y	Y	n	Y	n	n	n	Y	n
6	n	n	n	n	n	n	n	Y	Y	n	Y	n	n	n	Y	n
7	n	n	n	n	n	n	n	Y	Y	n	Y	n	n	n	Y	n
8	n	n	n	n	n	n	n	n	n	n	Y	n	n	n	Y	n
9	n	n	n	n	n	n	n	n	n	n	Y	n	n	n	Y	n
10	n	n	n	n	n	n	n	Y	Y	n	Y	n	n	n	Y	n
11	n	n	n	n	n	n	n	n	n	n	Y	Y	n	Y	n	n
12	n	n	n	n	n	n	n	n	n	n	Y	Y	n	n	Y	n
13	n	n	n	n	n	n	n	n	n	n	Y	n	n	n	Y	n
14	n	n	n	n	n	n	n	n	n	n	Y	n	n	n	Y	n
15	n	n	n	n	n	n	n	n	n	n	Y	Y	Y	Y	Y	Y
16	n	n	n	n	n	n	n	n	n	n	Y	n	n	n	Y	Y

21.2 Elimination of Metrorail constraint to and through the regional core

As discussed in section 1.3.4 in page 14, the Metrorail constraint to and through the regional core has been removed from Ver 2.3.75. For the sake of documentation, below is a more detailed description of the constraint and its modeling-related aspects. This description came from previous model documentation.[103]

The Metrorail constraint through the regional core (sometimes referred to using the less precise term "transit constraint through the regional core") is a technical adjustment to the trip tables coming out of the mode choice process designed to reflect a WMATA policy assumption that, during peak periods, the Metrorail system may have insufficient capacity to handle all the demand traveling to and through the regional core. Typically, it is assumed that the Metrorail system will be able to handle all of the peak-period demand to and through the regional core in the near term, but, since demand is growing through time, the system might not be able to handle all the peak-period demand at some future time,

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[103] Moran, Milone, and Seifu, "User's Guide for the COG/ TPB Travel Demand Forecasting Model, Version 2.3.70. Volume 1 of 2: Main Report and Appendix A (Flowcharts)."

depending on the amount of growth in demand and the number of rail cars available in a given year. The assumed year at which the Metrorail system will be at its peak capacity during the peak periods to and through the regional core is known as the “binding year.” For years beyond the binding year, it is assumed that any growth in peak-period Metrorail demand to and through the regional core will be forced to switch to other travel modes (specifically, auto person trips). The Metrorail constraint was initiated by WMATA in 2000 to address funding shortfalls restricting the expansion of the rail fleet.[104] WMATA policy sets the binding year, which is currently set at 2020. This means that, for any forecast year past 2020, the Metrorail constraint is applied, i.e., forecasted peak-period Metrorail trips to and through the regional core are shifted to other travel modes (specifically, auto person trips). The regional core is defined as the set of Metrorail stations in the central employment area, i.e., the portion of the system bounded by Dupont Circle, U Street, New York Avenue (NOMA), Capital South, L’Enfant Plaza, Pentagon, Arlington Cemetery, and Rosslyn stations. This area is also sometimes referred to by technical audiences as “Ring 0” and “Ring 1.” In Figure 32, Ring 0 is shown as the white area shaped like a trapezoid in the center of downtown Washington, D.C. Ring 1 is shown as the gray area surrounding Ring 0. The two areas together comprise the regional core. Note that non-Metrorail-related transit trips and off-peak Metrorail trips are not affected by the Metrorail constraint process.

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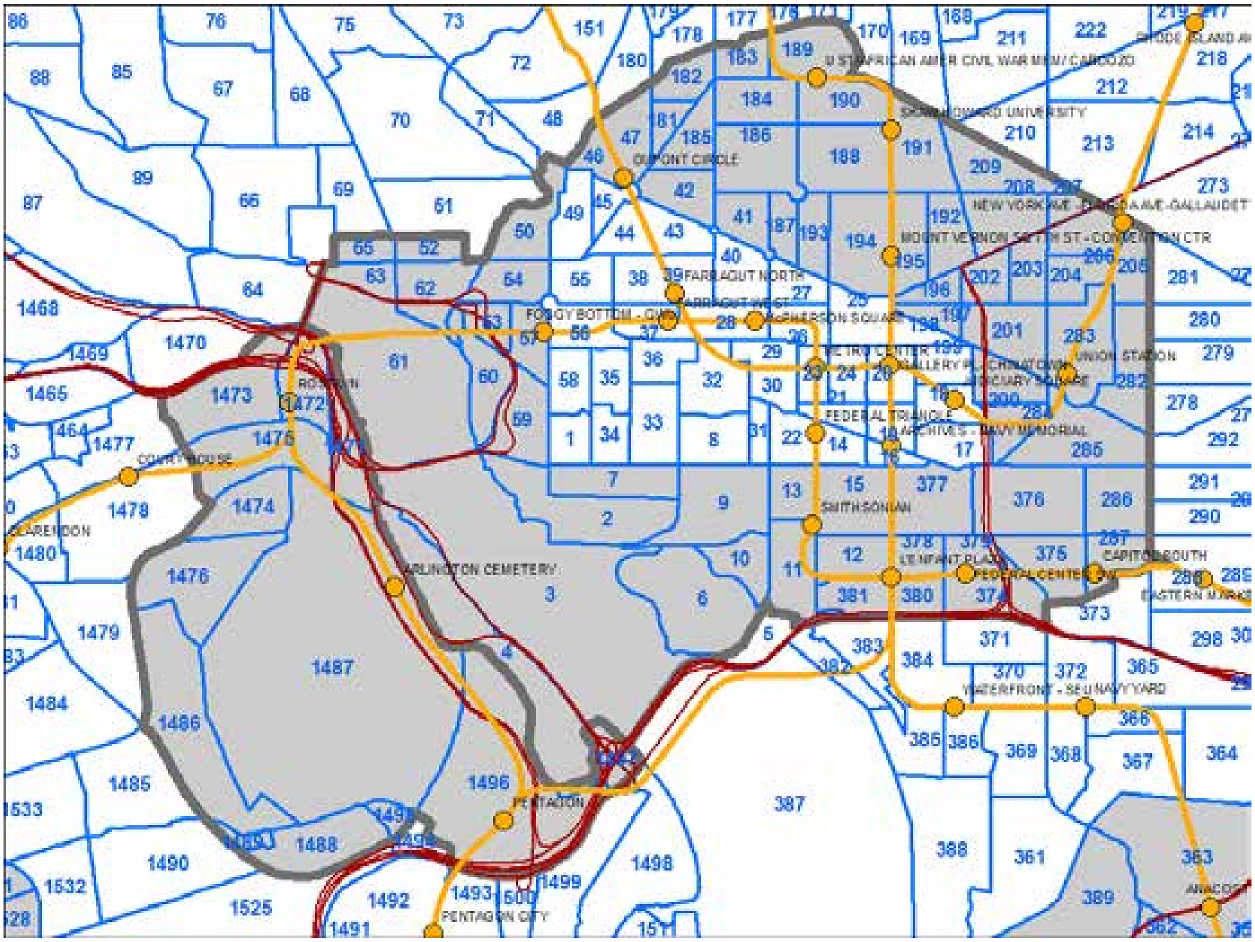
[104] Ronald Milone, “TPB Version 2.3 Travel Model on the 3,722-TAZ area system: Status report” (presented at the September 23, 2011 meeting of the Travel Forecasting Subcommittee of the Technical Committee of the National Capital Region Transportation Planning Board, held at the Metropolitan Washington Council of Governments, Washington, D.C., September 23, 2011).

Figure 32 Ring 0 (white trapezoid) and Ring 1 (gray polygon), which form the "core" area used in the Metrorail constraint through the regional core



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The Metrorail constraint is applied in the following way (assuming that 2020 is the binding year). Model runs representing the binding year and years prior to the binding year are conducted in the normal fashion, i.e., using the ***mode_choice.bat*** batch file (see page A-13 of Appendix A). Model runs representing any year following the binding year, e.g., 2030, are conducted using the ***mode_choice_tc_v23.bat*** batch file (see page A-13 of Appendix A), as follows:

- Peak 2020 Metrorail trips to and through the core are estimated using a time-of-day model.
- Peak 2030 Metrorail trips to and through the core are estimated using a time-of-day model.
- Peak 2030 Metrorail trips to and through the core are adjusted (downward) to match 2020 ridership levels.
- The "excess" 2030 Metrorail trips that cannot be accommodated are converted to auto person trips
- The constraint process occurs for each speed feedback iteration ("i1" through "i4).

Thus, the mode choice model is executed normally with the *mode_choice.bat* batch file, which invokes the following:

- Mode choice model application program (AEMS.EXE);
- Jurisdictional summary script (*MC_NL_Summary.s*);

By contrast, the mode choice model and Metrorail constraint process are executed using the *mode_choice_tc_v23.bat* batch file, which invokes the following:

- Mode choice model application program (AEMS.EXE);
- Jurisdictional summary script (*MC_NL_Summary.s*);
- Constraint adjustment script (*MC_Constraint_V23.s*);

21.3 Control/Support Files

The nested-logit mode choice (NLMC) model is applied using a Fortran program called AEMS.[105] AEMS.EXE is the compiled version of the source code AEMS.FOR. In order to run, AEMS.EXE needs to have several DLL files. The model is run one for each of the five trip purposes, as shown on page A-13 of the flowchart in Appendix A. Each run of the mode choice model requires a "control file," so there are five in total: HBW_NL_MC.CTL, HBS_NL_MC.CTL, HBS_NL_MC.CTL, NHW_NL_MC.CTL, and NHO_NL_MC.CTL. After the five mode choice models run, there is a Cube Voyager script, *MC_NL_Summary.s*, which is used to create jurisdiction-to-jurisdiction tabulations of the trip tables output from the mode choice model. The inputs to the AEMS mode choice application program are shown in Table 66. The outputs are shown in Table 67.

Table 66 Inputs to the AEMS mode choice application program

Daily person trips, stratified by income group (1, 2, 3, 4), in production/attraction format (INFILE 1)	hbw_income.ptt, hbs_income.ptt, hbo_income.ptt, nhw_income.ptt, nho_income.ptt	Binary
Highway skims, nine tables – SOV, HOV2, HOV3+ for time, distance, and tolls on non-variably-priced facilities (INFILE 2)	hwyam.skm, hwyop.skm	Binary
Commuter rail transit skims (INFILE 3)	trnam_cr.skm, trnop_cr.skm	Binary
All bus transit skims (INFILE 4)	trnam_ab.skm, trnop_ab.skm	Binary
Metrorail transit skims (INFILE 5)	trnam_mr.skm, trnop_mr.skm	Binary
Bus/Metrorail transit skims (INFILE 6)	trnam_bm.skm, trnop_bm.skm	Binary
Zonal data (INFILE 8)	zonev2.a2f	Text

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[105] "AECOM Consult Mode Choice Computation Programs, AEMS, Users Guide," Draft report (Fairfax, Virginia: AECOM Consult, Inc., April 5, 2005).

Table 67 Outputs from the AEMS mode choice application program

Daily person trips, stratified by travel mode (14 tables): 1. DR ALONE 2. SR2 3. SR3+ 4. WK-CR 5. WK-BUS 6. WK-BU/MR 7. WK-MR 8. PNR-CR & KNR-CR 9. PNR-BUS 10. KNR-BUS 11. PNR-BU/MR 12. KNR-BU/MR 13. PNR-MR 14. KNR-MR	hbw_nl_mc.mtt, hbs_nl_mc.mtt, hbs_nl_mc.mtt, nhw_nl_mc.mtt, nho_nl_mc.mtt	Binary

21.4 Market segmentation

Most mode choice models used in large urban areas in the U.S. have historically been estimated at a disaggregate level but are applied at an aggregate level. Specifically, these models are typically estimated at the person-trip level but applied at the zone-to-zone interchange level. Furthermore, in application mode, within each zone-to-zone interchange, many models subdivide the travel market into homogeneous groups, known as market segments. The nested-logit mode choice model (NLMC) that is used in the Version 2.3 Travel Model uses three types of market segmentation:

- Household income
- Geography
- Access to transit

Note that there has been a recent trend away from disaggregate estimation, due, in part to guidance from the FTA.[106]

21.4.1 Market segmentation by household income

The income segmentation is the same that is used for the first two steps of the travel model (i.e., trip generation and trip distribution), namely households are segmented by the four household income quartiles, which are shown in Table 68.[107]

Table 68 Household income quartiles computed from the ACS

Quartile	Income range (2007 dollars)
First	Less than $50,000
Second	$50,000 to $99,999
Third	$100,000 to $149,999
Fourth	$150,000 or more

21.4.2 Market segmentation by geography

When AECOM Consult, Inc. first developed a mode choice model for the Washington, D.C. metropolitan area in 2004-2005, it divided the modeled area into seven superdistricts:[108]

1. DC core
2. VA core
3. DC urban

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[106] See, for example, Federal Transit Administration, "Discussion Piece #16: Calibration and Validation of Travel Models for New Starts Forecasting" (Workshop on Travel Forecasting for New Starts Proposals, Minneapolis, Minnesota, 2006), http://www.fta.dot.gov/planning/newstarts/planning_environment_5402.html.

[107] Hamid Humeida to Files, "Analysis of Data from the American Community Survey (ACS): Households by Household Income, Household Size, and Vehicle Availability," Memorandum, March 19, 2010.

[108] Bill Woodford, "Development of Revised Transit Components of Washington Regional Demand Forecasting Model" (December 1, 2004), 30.

4. MD urban
5. VA urban
6. MD suburban
7. VA suburban

AECOM’s mode choice model was applied as a post process to the COG/TPB travel model (the Version 2.1 Travel Model). COG/TPB staff used the AECOM post-process mode choice model as a starting point for its work on the Version 2.3 Travel Model in work done from 2008 to 2011. TPB staff integrated the mode choice model into the modeling chain (i.e., moved from a post process for the regional model to its normal position in the speed feedback loop, following trip distribution), and re-calibrated the model. **When COG/TPB staff retained and re-calibrated the NLMC model, it retained the same geographic market segmentation that had been developed by AECOM**.

These seven superdistricts are shown in Figure 33 and in Table 69. Table 69 shows the equivalency between the seven NLMC superdistricts and the new 3,722-TAZ area system.

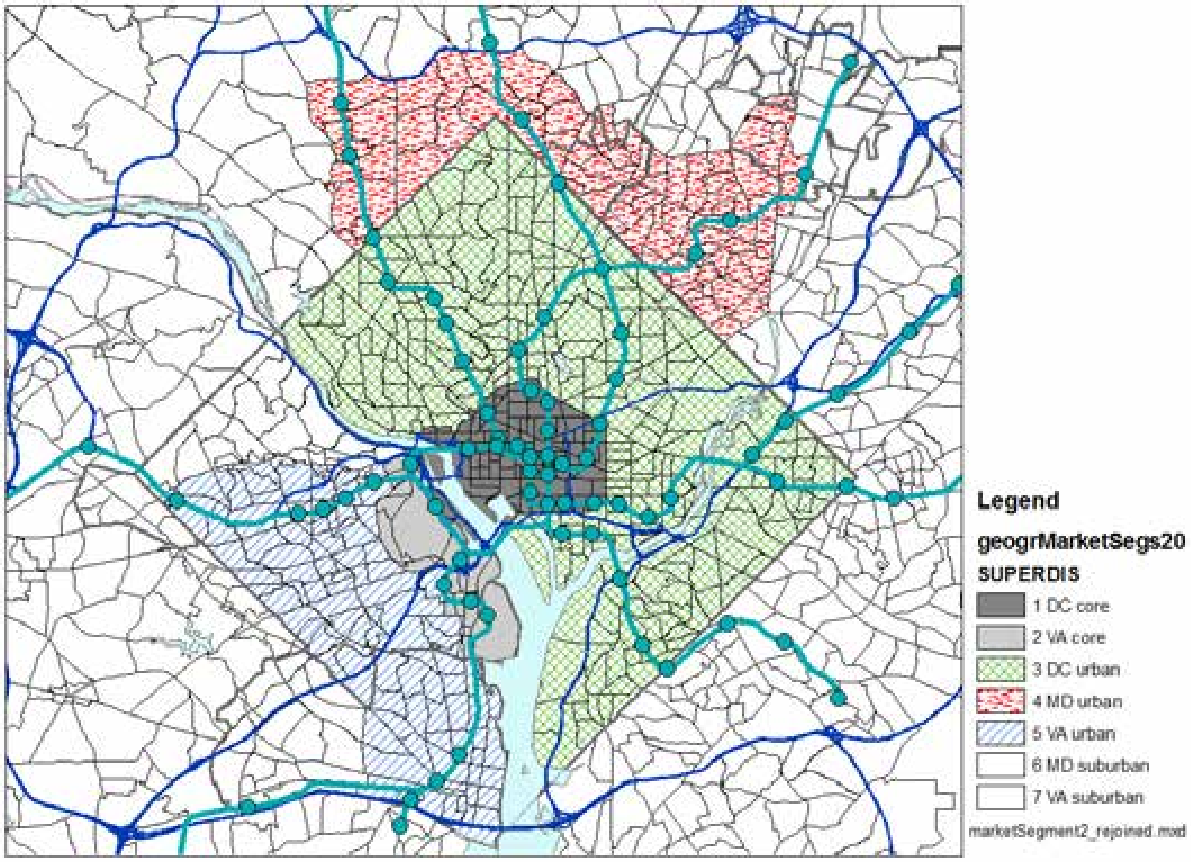

Figure 33 Seven superdistricts used in the Version 2.3 nested-logit mode choice model

Ref: "I:\ateam\nest_log\marketsegment2_rejoined.tif"

Table 69 Equivalency between nested-logit mode choice superdistricts and TPB TAZ 3,722

No.	Name	TAZs (TPB TAZ 3,722)
1	DC core	1-4,6-47,49-63,65,181-287,374-381
2	VA core	1471-1476,1486-1489,1493,1495-1504,1507,1508,1510,1511
3	DC urban	5,48,51,64,66-180,210-281,288-373,382-393
4	MD urban	603,606,612-628,630-640,662-664,669,670,913,916,917,939-957,959,961-982,985,
4	MD urban	986
5	VA urban	1405-1422,1427-1435,1448,1452,1454-1464,1477-1485,1490-1492,1494,1505,1506,
5	VA urban	1509,1512-1545,1569-1609
6	MD suburban	394-602,604,605,607-611,629,641-661,665-668,671-912,914,915,918-938,958,960,
6	MD suburban	983,984,987-1404,2820-3102,3104-3409
7	VA suburban	1423-1426,1436-1447,1449-1451,1453,1465-1470,1546-1568,1610-2554,2556-2628,
7	VA suburban	2630-2819,3410-3477,3479-3481,3483-3494,3496-3675

Ref: "I:\ateam\nest_log\equiv_tpbTaz3722_nlmc_superdistr.txt" and "I:\ateam\nest_log\Market_segment_NewTAZs_sorted.xlsx"

The TAZs in Table 69 are referred to as "TPB TAZ" to distinguish them from "COG TAZ." In 2008 and 2009, the COG GIS staff developed a new system of transportation analysis zones (TAZs), which had more zones, but did not increase the size of the modeled area. In other words, the new zones were, on average, smaller than the previous zone system, which is useful for better modeling of transit trips. The old zone system had 2,191 TAZs and the new system has 3,722 TAZs. After the COG GIS staff was finished with their work, the COG models development group reviewed the new zone system and found a few cases where the zone boundaries needed adjustment.[109] The final result was that there were now two sets of zones for the 3,722-TAZ area system:

- COG TAZs: For land activity forecasts (COGTAZ3722_TPBMOD)
- TPB TAZs: For transportation modeling (TPBTAZ3722_TPBMOD)[110]

Although seven market areas could lead to 49 (= 7 x 7) geographic interchanges, AECOM Consult, Inc. grouped them into the 20 paired production/attraction areas shown in Table 70 and Table 71. Another way to view the 20 geographic market segments is shown in Table 72.

Table 70 Production and attraction market segments used in the TPB Version 2.3 NLMC model

Production Areas	Attraction Areas
1. DC Core / Urban	1. DC Core
2. MD Urban	2. VA Core
3. VA Core / Urban	3. Urban
4. MD Suburban	4. Suburban
5. VA Suburban	

Ref: "I:\ateam\nest_log\marketSeg.xls"

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[109] Meseret Seifu, "Review of New Zone System: 3722 Transportation Analysis Zones (TAZ)" (January 22, 2010), 4, http://www.mwcog.org/uploads/committee-documents/Zl5aV1dd20100122152445.pdf.

[110] Seifu, 23.

Table 71 20 geographic market segments used in the TPB nested-logit mode choice model

Market Seg No.	Prod Superdis	Attr Superdis	Production Area	Attraction Area
1	1,3	1	DC	DC core
2	1,3	2	DC	VA core
3	1,3	3,4,5	DC	Urban DC, MD, VA
4	1,3	6,7	DC	Suburban MD, VA
5	4	1	MD urban	DC core
6	4	2	MD urban	VA core
7	4	3,4,5	MD urban	Urban DC, MD, VA
8	4	6,7	MD urban	Suburban MD, VA
9	2,5	1	VA core/urban	DC core
10	2,5	2	VA core/urban	VA core
11	2,5	3,4,5	VA core/urban	Urban DC, MD, VA
12	2,5	6,7	VA core/urban	Suburban MD, VA
13	6	1	MD suburban	DC core
14	6	2	MD suburban	VA core
15	6	3,4,5	MD suburban	Urban DC, MD, VA
16	6	6,7	MD suburban	Suburban MD, VA
17	7	1	VA suburban	DC core
18	7	2	VA suburban	VA core
19	7	3,4,5	VA suburban	Urban DC, MD, VA
20	7	6,7	VA suburban	Suburban MD, VA

Ref: "I:\ateam\nest_log\marketSeg.xls"

Table 72 Equivalency between seven super-districts and the 20 geographic market segments

		1 DC core	2 VA core	3 DC urban	4 MD urban	5 VA urban	6 MD suburban	7 VA suburban
1	**DC core**	1	2	3	3	3	4	4
3	**DC urban**	1	2	3	3	3	4	4
4	**MD urban**	5	6	7	7	7	8	8
2	**VA core**	9	10	11	11	11	12	12
5	**VA urban**	9	10	11	11	11	12	12
6	**MD suburban**	13	14	15	15	15	16	16
7	**VA suburban**	17	18	19	19	19	20	20

Ref: "I:\ateam\nest_log\superDistr_marketSeg.xlsx"

21.4.3 Market segmentation by access to transit

The section of the report contains two subsections. The first includes a general discussion about how transit-access markets are developed in relatively simple mode choice models. It gives the example of the three transit access markets that are often used by the Federal Transit Administration (FTA): "can walk," "must drive," and "no transit."[111] The second subsection describes the more specific case of the

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[111] See, for example, Federal Transit Administration, "Discussion Piece #11: Illustrative Mode-Choice and Summit Calculations for Travel by One Market Segment between a Pair of Zones for Base and Build Alternatives"

seven transit-access markets used in the mode choice model of the Version 2.3 Travel Model. In both the general discussion and the more specific case, zonal percent-walk-to-transit (PWT) values are used to develop the transit access markets. In the latter case, the mode choice model application program is AEMS.EXE, developed by AECOM.

21.4.3.1 General discussion

The purpose of a mode choice model is to predict the number and or share of trips that will be made by each major travel mode represented in a model. Transit, in one form or another, is usually one of the travel modes represented in most mode choice models. In order to use transit, one must be able to access it, either via non-motorized modes, such as walking and biking, or motorized modes, such as driving an automobile. Many mode choice models segment transit trips by walk access and drive access. A typical zonal metric for how easily one may walk to transit is the "percent walk to transit" (PWT) value, which is defined as the percent of a zone's area that is within walking distance to transit service. So, for example, a PWT value of 20% means that 20% of the zone's area lies within walking distance to transit service. If walking distance has been defined to be one mile, then this means that 20% of the zone lies within one mile of transit service. The walking distance threshold is set by the modelers in each urban area and should reflect the typical distance that people are likely to walk to reach transit. Typical values range from 0.5 miles to 1 mile. Some travel models, such as the TPB Version 2.3 Travel Model, make use of two walk-to-transit threshold distances, e.g., a short-walk distance (e.g., 0.5 miles) and a long-walk distance (e.g., 1 mile). The TPB travel model is discussed in the next section of the report. For this section of the report, it is assumed that there is only one walk-to-transit threshold distance (e.g., 1 mile).

A typical method for calculating the percent walk to transit for each zone in the modeled area is the following:

1. Determine a threshold distance for walking to transit (or two threshold distances may be used).
2. Determine point locations where transit service can be accessed (i.e., transit stop nodes and transit stations). In other words, create a geographic data set that includes all the points representing transit stop nodes and transit stations.
3. Determine transit walksheds, which are polygons composed of circular areas around transit stop nodes. In other words, create a geographic data set that represents point buffers (i.e., circles of radius X = the threshold walking distance) around each transit stop node and transit station.
4. Given that there is already a polygon layer of TAZ boundaries, perform a polygon-on-polygon overlay (TAZ boundaries and walkshed boundaries) to create a new geographic data set that can be used to calculate the percent walk to transit value for each zone.
5. Calculate the percent walk to transit values for each zone.[112]

(Workshop on Travel Forecasting for New Starts Proposals, Minneapolis, Minnesota, 2006), http://www.fta.dot.gov/planning/newstarts/planning_environment_5402.html.

[112] See, for example, Yew Yuan, "Transit Walkshed Generator: A GIS Application to Generate Transit Walksheds, Technical Report," Draft (Washington, D.C.: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board, November 15, 2012).

For a number of years, the Federal Transit Administration (FTA) has used a simple transit-access market segmentation system that has three segments known as "can walk," "must drive," and "no transit." These segments are defined at the zone-to-zone interchange level (the level used by most mode choice application programs) and can be determined using the percent-walk-to-transit (PWT) values in the production and attraction zones of the interchange. Before defining these three transit access markets, one must make a few assumptions:

1. Trips are in production/attraction format, not origin/destination format:
    a. A trip **production** is defined as the **home**-end of a home-based trip, or the **origin** of a non-home-based trip.
    b. A trip **attraction** is defined as the **non-home**-end of a home-based trip, or the **destination** of a non-home-based trip.
2. Travelers "access" transit at the production end of the trip and "egress from" transit at the attraction end of the trip.
3. At the production end of the trip, one may access the transit system by either walking or driving. Bike access is considered part of "walking."
4. At the attraction end of the trip, the only egress option is walking, since it is assumed that travelers do not have an automobile available at the non-home end of the trip.
5. The zonal PWT value functions as a probability value. Thus, if the PWT is 20%, this can be interpreted as meaning that, for trips that start (are produced in) or end (are attracted to) this zone, there is a 20% chance of that the trips will access or egress from the transit system via walking.

The "can walk" market is defined as the set of trips, within a given zone-to-zone interchange, where one can walk to transit at the production end of the trip (One can also walk from transit at the attraction end of the trip, but this is not a distinguishing feature, since "must drive" trips also walk from transit at the attraction end of the trip). Even though a trip may be included in the "can walk" segment, it is understood that drive access to transit is also a possibility for this market. In probability theory, if two events, A and B, are independent, the probability of the intersection of A and B equals the product of the probabilities of A and B, i.e.,

$$P(AB) = P(A) * P(B)$$

Since the PWT is considered a probability or likelihood of walking, and since the PWT for two given zones are considered to be independent, then, for a given zone-to-zone interchange, the probability of being in the "can walk" market -- P("can walk") or P(CW) -- is simply the product of the PWT of the production zone and the PWT of the attraction zone:

$$P("can\ walk"\ for\ interchange\ ij) = PWT(i) * PWT(j)$$

The "must drive" market includes trips that must access the transit market via driving since the trip begins outside of the transit walk-access threshold distance. The "no transit" market includes trips for which transit is not an option, since, at the attraction end of the trip, there is no transit available within walking distance. So, for a given interchange, the probability of being in the "must drive" market --

P(“must drive”) or P(MD) -- is simply the product of the non-walkable share of the production zone and the PWT of the attraction zone:

$$P(\text{"}must\ drive\text{"}\ for\ interchange\ ij) = \big(1 - PWT(i)\big) * PWT(j)$$

Similarly, for a given interchange, the probability of being in the “no transit” market -- P(“no transit”) or P(NT) -- is simply the non-walkable share of the attraction zone:

$$P(\text{"}no\ transit\text{"}\ for\ interchange\ ij) = \big(1 - PWT(j)\big)$$

So, whereas the P(CW) and P(MD) are a function of the PWT in both the production and attraction zones, the P(NT) is a function of only the PWT in the attraction zone. For a given interchange

$$P(CW) + P(MD) + \ P(NT) = 100\%$$

Table 73 presents 11 examples, or cases, of how various production and attraction PWT values are combined to get the probabilities of being in the “can walk,” “must drive” and “no transit” zone-to-zone interchange market segments. For example, in the case #1, both the production zone and the attraction zone have percent-walk-to-transit (PWT) values of 0%, which results in the all the trips in the interchange being in the “no transit” market segment. By contrast, in case #2, PWT(i) = 0% and PWT(j) = 50%, which results in a 50%/50% split of trips in that interchange into the “must drive” and “no transit” markets. When, in case #3, PWT(i) = 0% and PWT(j) = 100%, this results in all trips being allocated to the “must drive” market.

In any of these cases, the number of trips in each of the three markets is equal to the total number of person trips in the zone-to-zone interchange times each of the three probabilities. **After trips have been assigned to the three markets, then the mode choice model is applied**, as described FTA’s Discussion Piece #11 (Discussion_11_Summit_Calcs.doc) and shown in its associated spreadsheet (Discussion_11_Summit_Example_Calcs.xls).[113]

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[113] Federal Transit Administration, “Discussion Piece #11: Illustrative Mode-Choice and Summit Calculations for Travel by One Market Segment between a Pair of Zones for Base and Build Alternatives.”

Table 73 Eleven examples showing how zonal percent-walk-to-transit values translate into probabilities of being in three transit-access markets: can walk, must drive, and no transit

	Zonal Attributes		**Zone-to-Zone Interchange Attributes**			
	Percent Walk to Transit Prod. Zone	**Percent Walk to Transit Attr. Zone**	**Probability "Can Walk"**	**Probability "Must Drive"**	**Probability "No Transit"**	**Total Probability**
	PWT(i)	PWT(j)	P(CW,ij)	P(MD,ij)	P(NT,ij)	
Case	A	B	A*B	(1-A)*B	(1-B)	
1	0%	0%	0.0%	0.0%	100.0%	100.0%
2	0%	50%	0.0%	50.0%	50.0%	100.0%
3	0%	100%	0.0%	100.0%	0.0%	100.0%
4	50%	0%	0.0%	0.0%	100.0%	100.0%
5	50%	50%	25.0%	25.0%	50.0%	100.0%
6	50%	100%	50.0%	50.0%	0.0%	100.0%
7	100%	0%	0.0%	0.0%	100.0%	100.0%
8	100%	50%	50.0%	0.0%	50.0%	100.0%
9	100%	100%	100.0%	0.0%	0.0%	100.0%
10	75%	50%	37.5%	12.5%	50.0%	100.0%
11	100%	75%	75.0%	0.0%	25.0%	100.0%

Ref: "percent_walk_transit_can_walk.xlsx"

Table 74, Table 75, and Table 76 provide a more complete picture of how P(CW), P(MD), and P(NT) each vary with the production and attraction PWT values. For example, Table 74 shows the probability of being in the “can walk” market segment for a zone-to-zone interchange as a function of the production and attraction percent-walk-to-transit values. The probability of “can walk” is zero if either the production PWT or the attraction PWT equal zero. By contrast, the probability of “can walk” is 100% only if the production PWT and the attraction PWT equal 100%.

Table 74 Probability of being in the "can walk" market segment for a zone-to-zone interchange, based on the production and attraction percent-walk-to-transit values

		PWT(i)										
		0%	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
PWT(j)	**0%**	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	10%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
	20%	0%	2%	4%	6%	8%	10%	12%	14%	16%	18%	20%
	30%	0%	3%	6%	9%	12%	15%	18%	21%	24%	27%	30%
	40%	0%	4%	8%	12%	16%	20%	24%	28%	32%	36%	40%
	50%	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
	60%	0%	6%	12%	18%	24%	30%	36%	42%	48%	54%	60%
	70%	0%	7%	14%	21%	28%	35%	42%	49%	56%	63%	70%
	80%	0%	8%	16%	24%	32%	40%	48%	56%	64%	72%	80%
	90%	0%	9%	18%	27%	36%	45%	54%	63%	72%	81%	90%
	100%	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

Ref: "percent_walk_transit_can_walk.xlsx"

Table 75 shows the probability of being in the "must drive" market segment for a zone-to-zone interchange as a function of the production and attraction percent-walk-to-transit values. The probability of "must drive" is zero if either the production PWT equals 100% or the attraction PWT equal zero. By contrast, the probability of "must drive" is 100% only if the production PWT equals zero and the attraction PWT equals 100%.

Table 75 Probability of being in the "must drive" market segment for a zone-to-zone interchange, based on the production and attraction percent-walk-to-transit values

		PWT(i)										
		0%	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
PWT(j)	**0%**	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	10%	10%	9%	8%	7%	6%	5%	4%	3%	2%	1%	0%
	20%	20%	18%	16%	14%	12%	10%	8%	6%	4%	2%	0%
	30%	30%	27%	24%	21%	18%	15%	12%	9%	6%	3%	0%
	40%	40%	36%	32%	28%	24%	20%	16%	12%	8%	4%	0%
	50%	50%	45%	40%	35%	30%	25%	20%	15%	10%	5%	0%
	60%	60%	54%	48%	42%	36%	30%	24%	18%	12%	6%	0%
	70%	70%	63%	56%	49%	42%	35%	28%	21%	14%	7%	0%
	80%	80%	72%	64%	56%	48%	40%	32%	24%	16%	8%	0%
	90%	90%	81%	72%	63%	54%	45%	36%	27%	18%	9%	0%
	100%	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%

Ref: "percent_walk_transit_can_walk.xlsx"

Table 76 shows the probability of being in the "no transit" market segment for a zone-to-zone interchange as a function of solely on the attraction percent-walk-to-transit values. The probability of "no transit" is zero only if the attraction PWT equals 100%. By contrast, the probability of "no transit" is 100% only if attraction PWT equals zero.

Table 76 Probability of being in the "no transit" market segment for a zone-to-zone interchange, based solely on the attraction percent-walk-to-transit values

		PWT(i)										
		0%	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
PWT(j)	**0%**	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	10%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%
	20%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
	30%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
	40%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%
	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
	60%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
	70%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
	80%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	90%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Ref: "percent_walk_transit_can_walk.xlsx"

21.4.3.2 Version 2.3 Travel Model and AEMS

Regarding the percent-walk-to-transit (PWT) values used by the mode choice model of the TPB Version 2.3 Travel Model, two distance thresholds are used:

- Short walk to transit: ≤ 0.5 mile
- Long walk to transit: > 0.5 mile and ≤ 1 mile

Furthermore, the mode choice model differentiates between peak period transit service and off-peak period transit service. When calculating average headways and run times for transit routes running during the peak and off-peak periods, the historical practice, which is continued to this day, has been to use a subset of the period to represent service during the entire period. Specifically, the one-hour time period from 7:00 AM to 7:59 AM is used to represent peak-period conditions, and the five-hour time period from 10:00 AM to 2:59 PM is used to represent off-peak-period conditions.[114] It is also assumed that home-based-work (HBW) trips occur in the peak periods, and thus make use of the peak-period transit skims and peak-period PWT values. Similarly, it is assumed that the other trip purposes (HBO, HBS, NHW, and NHO) occur in the off-peak periods, and thus make uses of the off-peak transit skims and off-peak PWT values.

The mode choice model in the TPB Version 2.3 Travel Model is a 15-choice, nested-logit mode choice (NLMC) model that includes

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[114] Seifu, Milone, and Moran, "Highway and Transit Networks for the Version 2.3.66 Travel Model, Based on the 2016 CLRP and FY 2017-2022 TIP," 8.

- Three auto modes (drive alone [DA], shared ride 2-person [SR2], and shared ride 3+person [SR3]);
- Four transit modes (commuter rail [CR], all bus [AB], all Metrorail [MR], and combined bus/Metrorail[BM]); and
- Three modes of access to transit (park and ride [PNR], kiss and ride [KNR], and walk [WK])

These 10 modes are combined in nests, in such a way that there are 15 choices in the mode choice model, as shown in Figure 31 (p. 155). The NLMC model is applied using the AECOM mode choice application program (AEMS).

Although light-rail transit (LRT), bus rapid transit (BRT), and streetcar are not explicit transit modes in the mode choice model, the model has, nonetheless, been designed to deal with these three special transit modes. Mode 5 is reserved for modeling LRT. Mode 10 is reserved for modeling BRT and streetcar. It is assumed that Mode 5 (LRT) will travel mostly on its own, dedicated right of way. By contrast, it is assumed that Mode 10 (BRT and streetcar) will travel mostly in mixed traffic on a shared right of way. Full details of how these three transit modes are modeled can be found in either the calibration report[115] or in section 21.1.1 of this report, but one of the key assumptions is the following:

- For transit path building/skimming, mode choice, and transit assignment
    - Mode 5 (LRT) is treated like Mode 3 (Metrorail)
    - Mode 10 (BRT or streetcar) is treated like Mode 1 (local bus)

When AECOM first developed the nested-logit mode choice model that TPB staff later adopted and recalibrated, AECOM used six percent-walk-to-transit values:[116]

- Percent of the zone within a short walk to Metrorail (Mode 3): PSWMET
- Percent of the zone within a long walk to Metrorail (Mode 3): PLWMET
- Percent of the zone within a short walk to any transit in the AM peak period: PSWALLAM
- Percent of the zone within a long walk to any transit in the AM peak period: PLWALLAM
- Percent of the zone within a short walk to any transit in the off-peak period: PSWALLOP
- Percent of the zone within a long walk to any transit in the off-peak period: PLWALLOP

However, in 2012, thanks to work done by Dusan Vuksan and Feng Xie, it was discovered that **the first two PWT values should include both Metrorail and LRT, not simply Metrorail**. This oversight had not been noticed before, since 1) LRT was not part of the base-year (year-2007) calibration networks, and 2) when LRT was modeled in close-in areas that already had significant transit service, the omission of LRT PWT values from the Metrorail/LRT group was hard to detect. However, in the work conducted by Dusan and Feng, the LRT service was in suburban areas without significant surrounding transit service,

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[115] Milone et al., "Calibration Report for the TPB Travel Forecasting Model, Version 2.3," 6–3 to 6–5.
[116] AECOM Consult, Inc., "Post MWCOG – AECOM Transit Component of Washington Regional Demand Forecasting Model: User's Guide" (AECOM Consult, Inc., March 2005), 11.

and it became apparent that the model was underestimating LRT ridership. The net effect is that the first two zonal PWT values now include both Metrorail and LRT together:

- Percent of the zone within a short walk to Metrorail (Mode 3) **or LRT (Mode 5)**: PSWMET
- Percent of the zone within a long walk to Metrorail (Mode 3) **or LRT (Mode 5)**: PLWMET
- Percent of the zone within a short walk to any transit in the AM peak period: PSWALLAM
- Percent of the zone within a long walk to any transit in the AM peak period: PLWALLAM
- Percent of the zone within a short walk to any transit in the off-peak period: PSWALLOP
- Percent of the zone within a long walk to any transit in the off-peak period: PLWALLOP

"Any transit" includes all transit, including Metrorail and LRT service.

As of the Ver. 2.3.57 model (and continued in subsequent models, including the Ver. 2.3.75 model), these new definitions have been incorporated in the automated ArcPy transit walkshed process.

There are two other assumptions governing the use of the six PWT values that need to be kept in mind. The first is definitional and the second relates to differentiating between peak-period and off-peak-period transit service. Regarding the definitional difference, when AECOM first developed the percent walk values, it defined them based on zonal areas:

$$Percent = \frac{walkshed\ area}{total\ zonal\ land\ area}$$

As an example, if a zone has half of its land area in the short-walk-to-Metrorail area and half of its land area in the long-walk-to-Metrorail area, one might expect that PSWMET = 50% and the PLWMET = 50%. However, the real PWT values for this scenario would be PSWMET = 50% and the PLWMET = 100%, since the short-walk area is always contained within the long-walk area. Consequently, if one wants the net area that is in the long walk area, one must subtract the two areas:

$$\text{Net Percent Long Walk} = (\text{Percent long walk}) - (\text{Percent short walk})$$

Evidence of this will be seen in later calculations discussed in this report.

The second assumption about PWT values relates to the coverage of transit service in the peak period versus in the off-peak period. It is assumed that transit service is accessed at the transit stop nodes (e.g., bus stops) and transit stations. In the case of Metrorail, there are no examples of stations that operate in the peak period, but do not operate in the off-peak period. Instead, all stations operate in all periods, even though the frequency of service changes (peak versus off-peak), and there are some segments that exist in the off-peak but not in the peak (e.g., in 2006, WMATA began running the Yellow Line from Gallery Place to Fort Totten, but only in the off-peak). However, since the transit walkshed buffers are drawn around points, and not segments, this does not affect Metrorail, meaning that the percent-walk-to-transit values need not be calculated separately for peak and off-peak Metrorail. Furthermore, now that we are including LRT with Metrorail for determining walksheds and calculating PWT values, it is also assumed that there is no difference between LRT stations operating in the peak periods and those in the off-peak.

Finally, transit access markets are determined within the mode choice application program (AEMS) by combining information from the six PWT values already discussed. AEMS is a compiled Fortran program, which requires a control file (*.CTL) for each mode choice model. The Version 2.3 Travel Model uses five mode choice models (one per trip purpose), and so it requires five control files (e.g., HBW_NL_MC.CTL, HBS_NL_MC.CTL, HBO_NL_MC.CTL, etc.). Percent-walk-to-transit values are stored in a zonal data file (ZONEV2.A2F) that is read into AEMS.

The remainder of this section of the report draws heavily from a 2012 memo from AECOM staff to COG/TPB staff.[117]

In each of the AEMS control files, the six PWT values are referenced using the following 4-character pattern:

<production or attraction indicator (1 char)><file number (1 char)><table number (2 char)>

The production or attraction zone status is indicated using the letter "i" (production") or "j" (attraction). In the current AEMS control files, the file number for the zonal data file is "8." Using current modeling conventions, the table numbers for the percent-walk-to-transit values go from 7 to 12 (and this information is noted in comment records in the AEMS control files). Thus, the following 3-digit codes refer to the six PWT values:

- 807: Percent of the zone within a short walk to Metrorail (Mode 3) or LRT (Mode 5): PSWMET
- 808: Percent of the zone within a long walk to Metrorail (Mode 3) or LRT (Mode 5): PLWMET
- 809: Percent of the zone within a short walk to any transit in the AM peak period: PSWALLAM
- 810: Percent of the zone within a long walk to any transit in the AM peak period: PLWALLAM
- 811: Percent of the zone within a short walk to any transit in the off-peak period: PSWALLOP
- 812: Percent of the zone within a long walk to any transit in the off-peak period: PLWALLOP

For example, if the control file refers to "i807", this means the percent of the zone within a short walk to Metrorail or LRT for production zone "i".

The aforementioned six percent-walk-to-transit values define the percentage of the zonal area that is within walking distance to transit, but they do not indicate the share of productions or attractions are assumed to walk. For example, not all transit trips that begin in a long-walk area will actually end up walking to transit (some will drive access). Consequently, the next step in the process is to calculate six values representing the likely walk-access markets. To do this, two assumptions are made:

1. 100% of the transit trips beginning or ending in the short-walk area will access transit via walking;

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[117] David Roden to Mark S. Moran, "Memorandum for Task Order 7 (FY13 Task 1) of COG Contract 12-006, Interpreting AEMS Market Shares," Memorandum, September 24, 2012.

2. Only 25% of the transit trips beginning or ending in the long-walk area will access transit via walking (i.e., 75% are assumed to use drive access).

The six assumed walk markets are the following:

`PCMI`	Percent of trips assumed to access Metrorail/LRT via walking at the production zone
`PCMJ`	Percent of trips assumed to access Metrorail/LRT via walking at the attraction zone
`PCTIAM`	Percent of trips assumed to access all transit via walking at the production zone, AM peak per.
`PCTJAM`	Percent of trips assumed to access all transit via walking at the attraction zone, AM peak per.
`PCTIOP`	Percent of trips assumed to access all transit via walking at the production zone, off-peak per.
`PCTJOP`	Percent of trips assumed to access all transit via walking at the attraction zone, off-peak per.

Percent-walk-to-transit values are calculated using point buffers around transit stop nodes (i.e., stations, bus stops, etc.). As is the case with the original percent-walk-to-transit values, it is assumed that Metrorail and LRT service, in terms of stations in service, does not vary by time of day. By contrast, it is assumed that time-of-day variations in other transit modes, such as bus or commuter rail, will mean that the set of AM stop nodes will be different from the off-peak stop nodes. For this reason, there are two sets of percent-walk-to-transit values for all transit (one for AM and one for off peak), but only one for Metrorail and LRT.

For each of the five mode choice models (HBW, HBS, HBO, NHW, NHO), only four of these values are used at once (HBW gets AM and the other purposes get off-peak):

- PCMI: Percent of trips assumed to access Metrorail/LRT via walking at the production zone
- PCMJ: Percent of trips assumed to egress from Metrorail/LRT via walking at the attraction zone
- PCTI: Percent of trips assumed to access all transit via walking at the production zone
- PCTJ: Percent of trips assumed to egress from all transit via walking at the attraction zone

In all four cases, the following is assumed:

Percent of trips in the interchange assumed to be in one of the four categories =

(100% of the trips in the short-walk area) + (25% of the trips in the long-walk area)

In terms of equations in the mode choice control files, one finds:

- PCMI: Percent of trips assumed to access Metrorail/LRT via walking at the production zone
  - = (i807 + 0.25 * (i808 – i807)) / 100
- PCMJ: Percent of trips assumed to egress from Metrorail/LRT via walking at the attraction zone
  - = (j807 + 0.25 * (j808 – j807)) / 100
- PCTI: Percent of trips assumed to access "all transit" via walking at the production zone

  = (i809 + 0.25 * (i810 – i809)) / 100 for AM (used for HBW purpose)
  - = (i811 + 0.25 * (i812 – i811)) / 100 for off-peak (used for non-work purposes)
- PCTJ: Percent of trips assumed to egress from "all transit" via walking at the attraction zone
  - = (j809 + 0.25 * (j810 – j809)) / 100 for AM (used for HBW purpose)

- o = (j811 + 0.25 * (j812 – j811)) / 100 for off-peak (used for non-work purposes)

A distinction is drawn between Metrorail/LRT and "other transit" (i.e., transit that is neither Metrorail nor LRT). In the "can walk" market, there are four sub-markets, as shown in Table 77. Similarly, in the "must drive" market, there are two sub-markets, as shown in Table 78. Lastly, there is the "no access to transit" market, which is not part of either table.

Table 77 Four "can walk" sub-markets

Sub-mkt	Transit Service Available		Description
	Production TAZ	Attraction TAZ	
WM	MR/LRT	MR/LRT	Share that can use MR/LRT at both ends of the trip
W1	Other transit	MR/LRT	Share that can use "other transit" at production end and MR/LRT at attraction end of the trip
W2	Other transit	Other transit	Share that can use "other transit" at both ends of the trip
W3	MR/LRT	Other transit	Share that can use MR/LRT at production end and "other transit" at attraction end of the trip

Table 78 Two "must drive" sub-markets

Sub-mkt	Transit Service Available		Description
	Production TAZ	Attraction TAZ	
M1	Any transit	MR/LRT	Share that must drive to any transit at the production end and can use MR/LRT at the attraction end of the trip
M2	Any transit	Other transit	Share that must drive to any transit at the production end and can use "other transit" at the attraction end of the trip

AEMS makes use of WALK SEG commands to allow the model users to specify subzone segmentation such as "can walk," "must drive," and "no transit,"[118] so **the six sub-markets above, along with the "no transit" segment, are represented with <u>seven</u> WALK SEG (WS) variables in the AEMS control files**, and these six variables are calculated as follows from the previously-defined walk percentages:

"Can walk" market

- WSWM – Share of the "walk segment" that can use Metrorail/LRT at both ends of the trip
  = PCMI * PCMJ
- WSW1 – Share of the "walk segment" that can use "other transit" at production end and MR/LRT at attraction end of the trip
  = (PCTI – PCMI) * PCMJ
- WSW2 – Share of the "walk segment" that cannot walk to Metrorail/LRT at either end of the trip (i.e., can use "other transit" at both ends of the trip)

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[118] "AECOM Consult Mode Choice Computation Programs, AEMS, Users Guide," 29–31.

= (PCTI – PCMI) * (PCTJ – PCMJ)

- WSW3 – Share of the "walk segment" that can use MR/LRT at production end and "other transit" at attraction end of the trip
  = PCMI * (PCTJ – PCMJ)

"Must drive" market

- WSM1 – Share of the "walk segment" that must drive (to any transit) at the production, but can walk to Metrorail/LRT at the attraction
  = (1 – PCTI) * PCMJ
- WSM2 – Share of the "walk segment" that must drive (to any transit) at the production, but cannot walk to Metrorail/LRT at the attraction (i.e., must use "other transit" at the attraction)
  = (1 – PCTI) * (PCTJ – PCMJ)

"No transit" market

- WSNT – Share of the "walk segment" with no access to transit at the attraction end (thus, no access to transit for this zone-to-zone interchange)
  = (1 – WSWM – WSW1 – WSW2 – WSW3 – WSM1 – WSM2)

As was the case before with just three transit-access markets, the sum of the seven transit-access shares must equal 100% for any given interchange.

$$WSWM + WSW1 + WSW2 + WSW3 + WSM1 + WSM2 + WSNT = 100\%$$

Application of seven transit market segments to travel modes in the mode choice model

Given the aforementioned definitions of the transit-access market segments, the mode choice model must be applied to estimate the mode shares for each zone-to-zone interchange. In this case, the seven transit-access markets are applied in AEMS to the travel modes represented in the Ver. 2.3 nested-logit mode choice model as shown in Table 79.

Table 79 Application of the seven transit-access segments to travel modes represented in the Ver. 2.3 mode choice model

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
			SOV	SR2	SR3+	WK-CR	WK-BUS	WK-BU/MR	WK-MR	PNR-CR	KNR-CR	PNR-BUS	KNR-BUS	PNR-BU/MR	KNR-BU/MR	PNR-MR	KNR-MR
1	WM	Can walk MR/LRT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2	W1	Can walk 1	x	x	x	x	x	x		x	x	x	x	x	x	x	x
3	W2	Can walk 2	x	x	x	x	x	x		x	x	x	x	x	x		
4	W3	Can walk 3	x	x	x	x	x	x		x	x	x	x	x	x		
5	M1	Must drive 1	x	x	x					x	x	x	x	x	x	x	x
6	M2	Must drive 2	x	x	x					x	x	x	x	x	x		
7	NT	No transit	x	x	x												

Ref: "percent_walk_transit_can_walk.xlsx"

Where

- SOV = Drive Alone / single occupancy vehicle
- SR2 = Shared Ride with 2 persons

- SR3+ = Shared Ride with 3 or more persons
- WK-CR = walk to commuter rail
- WK-BUS = walk to bus
- WK-BU/MR = walk to/from bus and Metrorail/Light Rail
- WK-MR = walk to/from Metrorail/Light Rail only
- PNR-CR = park-n-ride to commuter rail
- KNR-CR = kiss-n-ride to commuter rail
- PNR-BUS = park-n-ride to bus
- KNR-BUS = kiss-n-ride to bus
- PNR-BU/MR = park-n-ride to bus and Metrorail/Light Rail
- KNR-BU/MR = kiss-n-ride to bus and Metrorail/Light Rail
- PNR-MR = park-n-ride to Metrorail/Light Rail

KNR-MR = kiss-n-ride to Metrorail/Light Rail

21.5 Transit access coding

In addition to the expanded set of transit submodes in the mode choice model, the Version 2.3 model includes new transit access coding enhancements which cover five areas:

1. The station file;
2. Sidewalk links and zonal walk links;
3. Zonal auto-access links;
4. Station transfer links; and
5. Zonal percent-walk-to-transit calculations.

21.5.1 Station file

The station file is a dBase file (station.dbf) that contains information about Metrorail stations, commuter rail stations, light rail stations, bus rapid transit stations/stops, street car stations/stops, express-bus bus stops, and park-and-ride lots that serve these stations/stops. Each station file is associated with one scenario, with the most typical scenarios being the "modeled year" (e.g., 2017, 2020, 2040). This file contains information such as:

- The mode code, a single-letter code indicating Metrorail (M), commuter rail (C), etc.
- A flag indicating whether the station is active in the given year/scenario (Y/N)
- A flag indicating whether the station PNR lot is active (Y/N)
- Station name

Six new columns/variables were added to the station file that were not present in earlier versions of the regional travel model (e.g., Ver. 2.2 and before). Only the first four of these six variables are currently used:

1. Access distance code (NCT)
2. Parking capacity
3. Peak-period parking cost

4. Off-peak-period parking cost
5. Peak-period shadow price (not used)
6. Off-peak-period shadow price (not used)

The full list of variables in the station file is described in Table 38 on page 120, with the new variables in bold font.

The "access distance code," known as NCT in the autoacc5.s script, is a newly added variable in the station file that controls the number, extent, and directionality of PNR/KNR access links generated for each parking lot (in the case of PNR) or each station (in the case of KNR). Table 39 describes the meaning of each of the six access distance codes.

The access distance code, along with the transit mode, determines the maximum link distance for the drive-access-to-transit links generated by autoacc5.s for the TPB nested-logit mode choice model. The maximum link distances for PNR are shown in Table 81. Although not shown in the table, the maximum allowed link distance for KNR links is 3 miles. It is also important to note that the KNR links are generated to Metrorail stations, light rail stations, streetcar stops, and bus stops with parking lots, but not commuter rail stations.

Table 80 shows the mode codes that are used in the station file. "Station centroids" are used to build minimum-impedance paths to all Metrorail and commuter rail stations. In the table below, even though modes 5 and 10 are shown as having a range of numbers designated for station centroids, only Metrorail and commuter rail actually require station centroids.

Table 80 Mode codes used in the consolidated station file/database (station.dbf)

Mode	Mode Code	Station Centroid Range	Station Node Range
Metrorail (Mode 3)	M	5000-5999	8000-8999
Commuter rail (Mode 4)	C	6000-6999	9000-9999
Light rail transit (Mode 5), Bus rapid transit/streetcar (Mode 10)	L, N	7000-7999*	10000-10999
Bus (Modes 1, 2, 6-9)	B	Not used	Not used

Notes: * Station PNR centroids (a.k.a. dummy station centroids) are not required for Mode 5 (LRT) or Mode 10 (BRT/streetcar).[119] For the sake of consistency, the current COG coding practice is to refrain from using station PNR centroids for LRT, BRT, and streetcar. In other words, in the station file, the STAC variable is coded with a value of zero.

21.5.2 Sidewalk links and zonal walk links

In the Version 2.2 travel model and earlier models, there was a walk network (sidewalk network), used for transferring from one transit line to another, in downtown DC and downtown Silver Spring, Maryland. In the Version 2.3 travel model, there is a sidewalk network in almost the entire modeled area. The regional sidewalk network is generated automatically using a script *walkacc.s* (see p. A-5 of

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[119] Jain to Milone and Moran, "MWCOG Network Coding Guide for Nested Logit Model (First Draft: September 20, 2007; Updated February 2008 and October 2010)," 6 and 10.

the flowchart in Appendix A). *walkacc.s* creates a sidewalk network by converting all suitable highway links into sidewalk links (Mode 13). Examples of highway links that are not converted into sidewalk links include freeways, parkways, and ramps (Facility Type = 1, 5, or 6). In order to limit the size of the sidewalk network to links that are likely used for walking, *walkacc.s* eliminates sidewalk links from zones where the “percent walk to transit” is zero. There is also a way to supply the program with a list of sidewalk links to be manually added or subtracted to the automated list of sidewalk links. For example, one can manually add a sidewalk link for Memorial Bridge, and one can manually remove sidewalk links that should not exist due to a physical barrier. See Jain’s 2010 memo for more details.[120]

walkacc.s also generates zonal walk-access-to-transit links (Mode 16 links). It automatically sweeps each TAZ, generating walk-access links from the zone centroid to all highway network nodes within a maximum walk distance (See Equation 3).

Equation 3 Maximum walk distance formula, used for generating walk-access-to-transit links

$$(\text{maximum walk distance}) = \sqrt{(\text{zonal area})} * 0.75$$

So, for a small, downtown zone with an area of 0.1 square miles, the program would calculate a maximum walk distance of 0.237 miles and connect all highway network stop nodes that lie within that distance from the zone centroid. There is an absolute maximum of 1.0 mile, which would be obtained for zones with a size of 1.78 square miles or greater. The actual calculated (straight-line) distance and computed walk time are stored on each link. No walk-access links are generated for zones with a zero percent walk to transit. Figure 34 shows zonal walk access links and sidewalk links in downtown Washington, D.C., near Farragut Square (TAZ 37, which is in the center of the figure). The thickest gray lines are the TAZ boundaries, which are not part of the actual highway or transit network, but are shown for reference. The lines emanating from each TAZ centroid (dark-blue, when the figure is viewed in color) are the zonal walk access links (Mode 16). The rectilinear (green) lines over many, but not all roads, are the sidewalk links (Mode 13). Mode 13 and 16 links can be shown in Cube Base by adding the four files “support link” files associated with walk-access to transit

- supl??wkam.asc for AM: suplABWKAM.asc, suplBMWKAM.asc, suplCRWKAM.asc, suplMRWKAM.asc
- supl??wkop.asc for off peak: suplABWKOP.asc, suplBMWKOP.asc, suplCRWKOP.asc, suplMRWKOP.asc

If prompted to give a coordinate file for 8,000-series nodes (Metrorail), use the following “support node” file: supnmrwkam.dbf. If prompted to give a coordinate file for 9,000-series nodes (commuter rail), use the following “support node” file: supncrwkam.dbf.

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[120] Manish Jain to Ronald Milone and Mark Moran, “MWCOG network coding guide for Nested Logit Model (First draft: September 20, 2007; Updated February 2008 and Oct. 2010),” Memorandum, October 2010, 7.

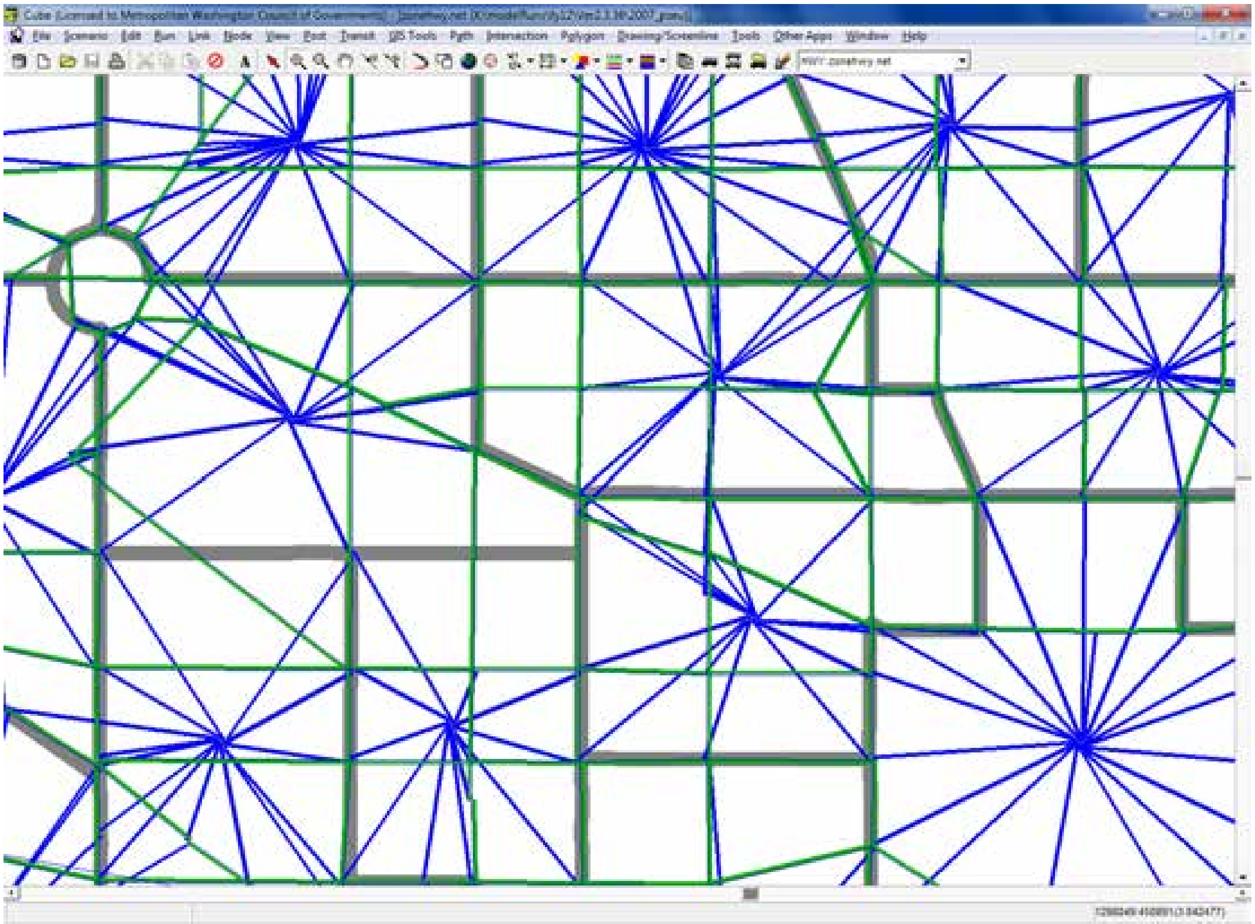

Figure 34 Zonal walk access links and sidewalk links in downtown DC near Farragut Square (Ver. 2.3 NL MC model)

Ref: "X:\modelRuns\fy12\Ver2.3.36\2007_pseu\zonehwy.net"

21.5.3 Zonal auto-access links

The Cube Voyager script *Autoacc5.s*, originally created by AECOM Consult as a Fortran program and later transferred to Voyager script by TPB staff, is used to generate auto-access-to-transit links. Zonal auto access links are generated by transit mode (Metrorail, commuter rail, light rail, BRT, streetcar, and bus) for both the peak ("AM") and off-peak ("mid-day") time periods. Auto access links (Mode 11) are a function of multiple criteria:

- Orientation toward downtown (defined as TAZ 8, which corresponds to The Elllipse, just south of The White House)
- A backtracking penalty and a prohibition of crossing the Potomac River (except for trips from Loudoun County to MARC commuter rail);
- A maximum link distance, which is a function of station type (e.g., terminal vs. non-terminal) and transit mode;
- Manually specified overrides; and
- Distances based on the highway skims from the highway network that includes dummy centroids representing Metrorail and commuter rail stations.

Table 81 Maximum link distances for drive-access-to-transit links: Ver. 2.3 NL MC model

Mode	Access Dist. Code	Maximum Connect. Length (miles)
Metrorail station PNR	1	15
Metrorail station PNR	2	5
Metrorail station PNR	3	3
Metrorail station PNR	0	3
Commuter rail station PNR	1	15
Commuter rail station PNR	2	10
Commuter rail station PNR	0	5
Bus PNR	1	5
Bus PNR	0	3
BRT/Street car PNR	1	5
BRT/Street car PNR	0	3
LRT PNR	1	5
LRT PNR	0	3

Ref: I:\ateam\meetings_conf\transitModelingGroup\2007-11-07\maxDistForAutoAccConnect.xls

Figure 35 shows kiss-and-ride (KNR) auto-access-to-transit links for the AM period associated with Metrorail stations in Northern Virginia.

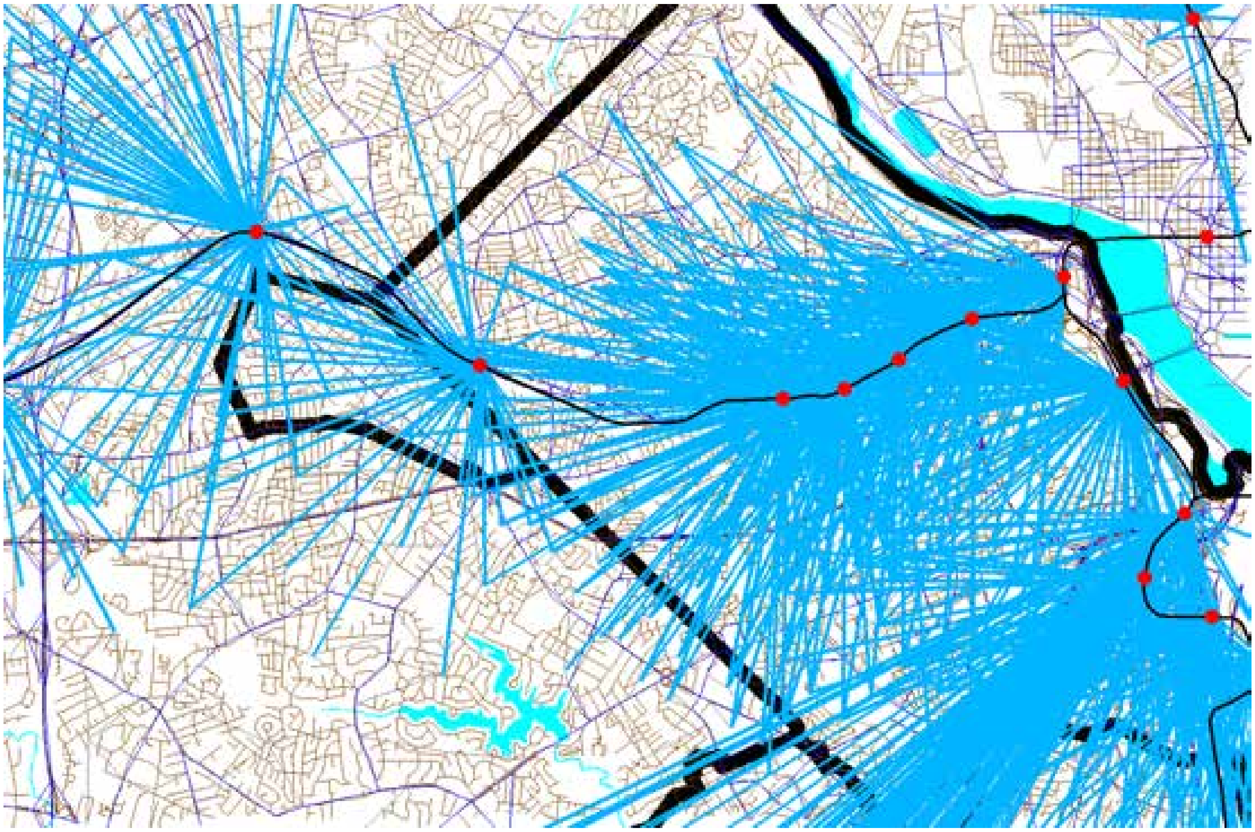

Figure 35 Kiss-and-ride (KNR) auto access links to Metrorail stations in Northern Virginia

Ref: "X:\modelRuns\fy12\Ver2.3.36\2007_pseu\zonehwy.net"

Figure 36 shows park-and-ride (PNR) auto-access-to-transit links for the AM period associated with Metrorail stations in Northern Virginia. Notice that the Orange Line stations from Clarendon to Rosslyn do not have PNR-access links, since they do not have PNR lots. By contrast, these stations do have KNR-access links, since these stations can have KNR access. The Pentagon Metrorail station is another example of a station where the model does not allow travelers to have PNR access, but they may have KRN access. Notice that the KNR-access links and PNR-access links are not shaped like a circular "starburst," but are somewhat flattened, due to the backtracking penalty. This was done to mimic the behavior of travelers who tend not to want to backtrack when driving to park at or be dropped off at a Metrorail or commuter rail station.

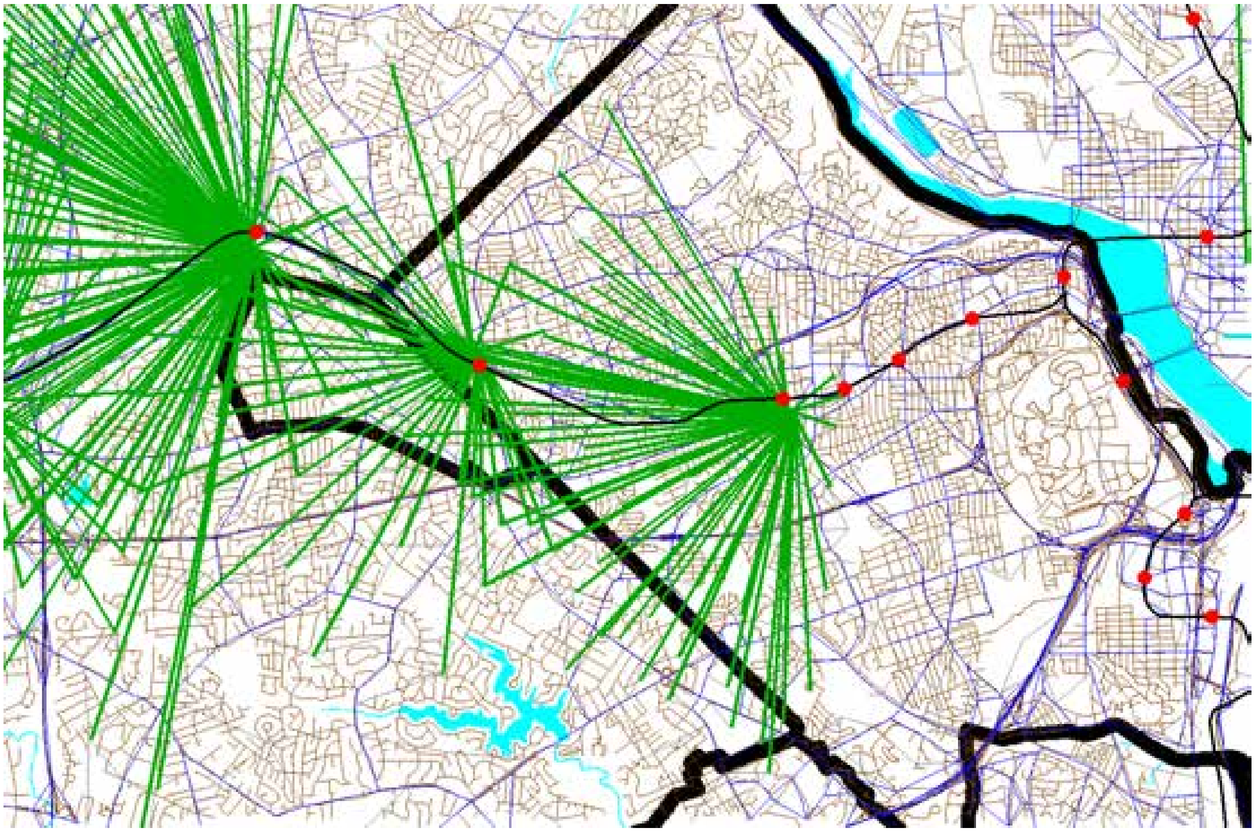

Figure 36 Park-and-ride (PNR) auto access links to Metrorail stations in Northern Virginia

Ref: "X:\modelRuns\fy12\Ver2.3.36\2007_pseu\zonehwy.net"

21.5.4 Station transfer links

Station transfer links are walk links connecting:

Stations and sidewalks (Mode 12)
Stations and bus service (Mode 12)
Stations and PNR lots (Mode 15)

These links are generated automatically from data in the station file. **For PNR-station transfer links, the walk time is a function of parking capacity and parking cost, since it is reasoned that bigger parking lots and more expensive parking lots make them more burdensome to use.**[121]

The station file also includes shadow parking price variables (STAPKSHAD & STAOPSHAD, see Table 38) which are not currently used. However, the PNR capacity and parking costs are coded into the station file and are used by *Parker.s* to create PNR-to-station links read into TRNBUILD. The PNR-to-station time/impedance is computed as:[122]

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[121] Jain to Milone and Moran, 6.
[122] Personal communication from Ron Milone, 9/25/13.

Equation 4 PNR-to-station time/impedance

$$(PNR\ time) = walk + SHAD + (MinPerDollar * park)$$

where

$(PNR\ time) = \text{PNR} - \text{to} - \text{station link time/impedance}$
$walk = (1\ to\ 5\ min)\text{Base time, which is a function of the number of PNR spaces}$
$SHAD = \text{Shadow cost (min.)}$
$MinPerDollar = \text{Equivalent minutes per dollar. Currently set to 6 (each dollar paid} = \text{6 min.)}$
$Park = Parking\ cost\ at\ station\ divided\ by\ two$

The Mode 15 links are generated by the script parker.s (see page A-5 of the flowchart in Appendix A). The following files contain the mode 15 links:

```
busampnr.tb
busoppnr.tb
comampnr.tb
comoppnr.tb
lrtampnr.tb
lrtoppnr.tb
metampnr.tb
metoppnr.tb
newampnr.tb
newoppnr.tb
```

The mode 12 links are developed manually using the COGTools geodatabase. These links can be found in the following files (see page A-5 of the flowchart in Appendix A):

```
Com_Bus.tb
LRT_bus.tb
Met_Bus.tb
NEW_bus.tb
```

21.5.5 Zonal percent walk to transit calculations

The zonal percent walk is the percent of a zone's area that lies within walking distance to transit service (i.e., a transit stop node, such as a bus stop or rail station). A short walk is defined as one that is less than or equal to 0.5 miles and a long walk is defined as one that is less than or equal to one mile. The following walk designations are used:

Short walk to Metrorail (<= 0.5 miles);
Long walk to Metrorail (>0.5 and <= 1.0 miles);
Short walk to AM transit;
Long walk to AM transit;
Short walk to off-peak transit;
Long walk to off-peak transit.

These walk-to-transit areas are sometimes called transit walksheds. Under contract with COG, AECOM has developed a new, automated/integrated Python/ArcPy walkshed process that is describe in Chapter 11 ("Building transit walksheds and calculating zonal walk percentages") on p. 95.

21.6 Transit path-building procedures

Given the segmentation in the model, 24 separate transit paths can be enumerated between each production zone and attraction zone:

Three modes of access to transit
1. Walk
2. Park and ride (PNR driver)
3. Ride to transit/KNR (drop-off/pick-up, or ride with a PNR driver)

Four transit modes/combinations
4. Commuter rail (alone and in combination with bus and/or Metrorail)
5. Bus-Metrorail (bus and Metrorail used in combination)
6. All bus (buses only)
7. All Metrorail (Metrorail only)

Two time-of-day periods
8. Peak (represented by transit service in the AM peak hour)
9. Off-peak (represented by transit service in the five-hour midday period)

However, at present, PNR and KNR to commuter rail are combined as a single path, since, for commuter rail, the PNR- and KNR-access links are identical. Consequently, the number of transit paths built between each production/attraction zone pair is 22. Table 82 summarizes the paths and available transit sub modes in each path. Again, in this figure, "drive to commuter rail" and "KNR to commuter rail" are combined into one category.

Run times for transit routes are controlled by the RUNTIME keyword (TRNBUILD).[123] As stated previously, path weights are consistent with the weights used in the mode choice model:

- Drive access time: Equal to 1.5 times the in-vehicle time
- Walk access time: Equal to 2.0 times the in-vehicle time
- Other out-of-vehicle time: Equal to 2.5 times the in-vehicle time

Headway combination between two or more transit routes is allowed to occur provided 1) the routes share the same transit mode code and 2) the difference between the run time and the minimum run time is less than a designated number of minutes (5 minutes for AM and 10 minutes for off peak). A maximum path time is set at 360 weighted minutes. There is no weighting of in-vehicle time by transit

---

[123] In Ver. 2.3.57a and earlier, bus IVT skims were adjusted to reflect the general level of road congestion using the factor table Lbus_TimFTRS.asc. In Ver. 2.3.66 and later models, this adjustment is now done directly to the mode 1, 6, and 8 local bus line files (*.TB) using the script Adjust_Runtime.s.

sub-modes (i.e., all transit modes have an IVT weight of 1.0). The maximum initial wait time for all ten transit modes is set at 60 perceived minutes. The minimum transfer wait time is 4.0 minutes for bus (Modes 1, 2, 6, 7, 8), 0 minutes for Metrorail (Mode 3), 4.0 minutes for commuter rail (Mode 4), 0 minutes for LRT (Mode 5), 10.0 minutes for express bus (Mode 9), and 4.0 minutes for Mode 10 (streetcar and/or BRT).

Table 82 Path-specific parameters used in transit path building

		Transit Submodes			
Path	**Path Parameter**	**Comm Rail**	**Express Bus**	**Local Bus**	**Metrorail**
Walk-to-Commuter Rail	Modes Available	X		X	X
	Weight	1.0		1.0	1.0
	Path Testing	must appear		can appear	can appear
Walk-to-Bus/Metrorail	Modes Available		X	X	X
	Weight		1.0	1.0	1.0
	Path Testing		either must appear		must appear
Walk-to-Bus	Modes Available		X	X	
	Weight		1.0	1.0	
	Path Testing		either must appear		
Walk-to-Metrorail	Modes Available				X
	Weight				1.0
	Path Testing				must appear
Drive-to-Commuter Rail	Modes Available	X		X	X
	Weight	1.0		1.0	1.0
	Auto access links to	CRsta. w/ parking		no	no
	Path Testing	must appear		can appear	can appear
K&R-to-Commuter Rail	Modes Available	X		X	X
	Weight	1.0		1.0	1.0
	Auto access links to	CRsta. w/ parking		no	no
	Path Testing	must appear		can appear	can appear
Drive-to-Bus/Metrorail	Modes Available		X	X	X
	Weight		1.0	1.0	1.0
	Auto access links to		all Bus park-ride lots		MRsta. w/ parking
	Path Testing		either must appear		must appear
K&R-to-Bus/Metrorail	Modes Available		X	X	X
	Weight		1.0	1.0	1.0
	Auto access links to		all Bus park-ride lots		all MRsta.
	Path Testing		either must appear		must appear
Drive-to-Bus	Modes Available		X	X	
	Weight		1.0	1.0	
	Auto access links to		all Bus park-ride lots		MRsta. w/ parking
	Path Testing		either must appear		
K&R-to-Bus	Modes Available		X	X	
	Weight		1.0	1.0	
	Auto access links to		all Bus park-ride lots		all MRsta.
	Path Testing		either must appear		
Drive-to-Metrorail	Modes Available				X
	Weight				1.0
	Auto access links				MRsta. w/ parking
	Path Testing				must appear
K&R-to-Metrorail	Modes Available				X
	Weight				1.0
	Auto access links				all MRsta.
	Path Testing				must appear

Source: AECOM Consult, Inc.[124]

21.7 Treatment of parking costs and terminal times for non-transit-related trips

Parking costs can be associated with either a transit trip (in the case of a drive-access transit trip) or a non-transit trip (an auto person trip, where no transit is involved). For drive-access transit trips, the cost of parking is stored in the station file. For park-and-ride (PNR)-to-station transfer links, the walk time is a function of parking capacity and parking cost,[125] but parking cost is not used as part of the transit path-building. For driving trips not involving transit, a parking cost model is used, where parking cost is a function of employment density. The next section of the report concerns parking costs that are not associated with a transit trip.

21.7.1 Non-transit-related parking costs

In applying the Version 2.3 model, prior to the execution of the mode choice model, a Voyager script (*prefarv23.s*) is used to generate zonal files containing zonal parking costs and highway terminal times (the time to park and "un-park" a vehicle). The files are, in turn, read into the mode choice model upon execution. The Version 2.3 model includes a new parking cost model estimated based on the 2007/2008 HTS.[126] HBW trip purpose utilizes the daily parking rate, while all other purposes use the hourly parking rate. Thus, two separate parking cost models were estimated, one for daily rates and one of hourly rates. For the daily rates model, the observed data indicated that it is rare for a traveler to incur parking costs in area types 4 and above, thus the model was estimated only for area types 1-3. A daily parking cost was estimated to be:

Equation 5 Daily non-transit-related parking cost for area types 1-3

$$\text{Non-transit-related parking cost} = 2.1724 * \ln(\text{floating employment density}) - 15.533$$

The resulting non-transit-related parking costs are also shown in Figure 37.

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[124] AECOM Consult, Inc., *Post MWCOG – AECOM Transit Component of Washington Regional Demand Forecasting Model: User's Guide* (AECOM Consult, Inc., March 2005).

[125] Jain to Milone and Moran, "MWCOG Network Coding Guide for Nested Logit Model (First Draft: September 20, 2007; Updated February 2008 and October 2010)," 6.

[126] Mary Martchouk to Mark S. Moran, "Developing a Parking Cost Model for Automobile Modes in the Version 2.3 Travel Model," Memorandum, June 14, 2010.

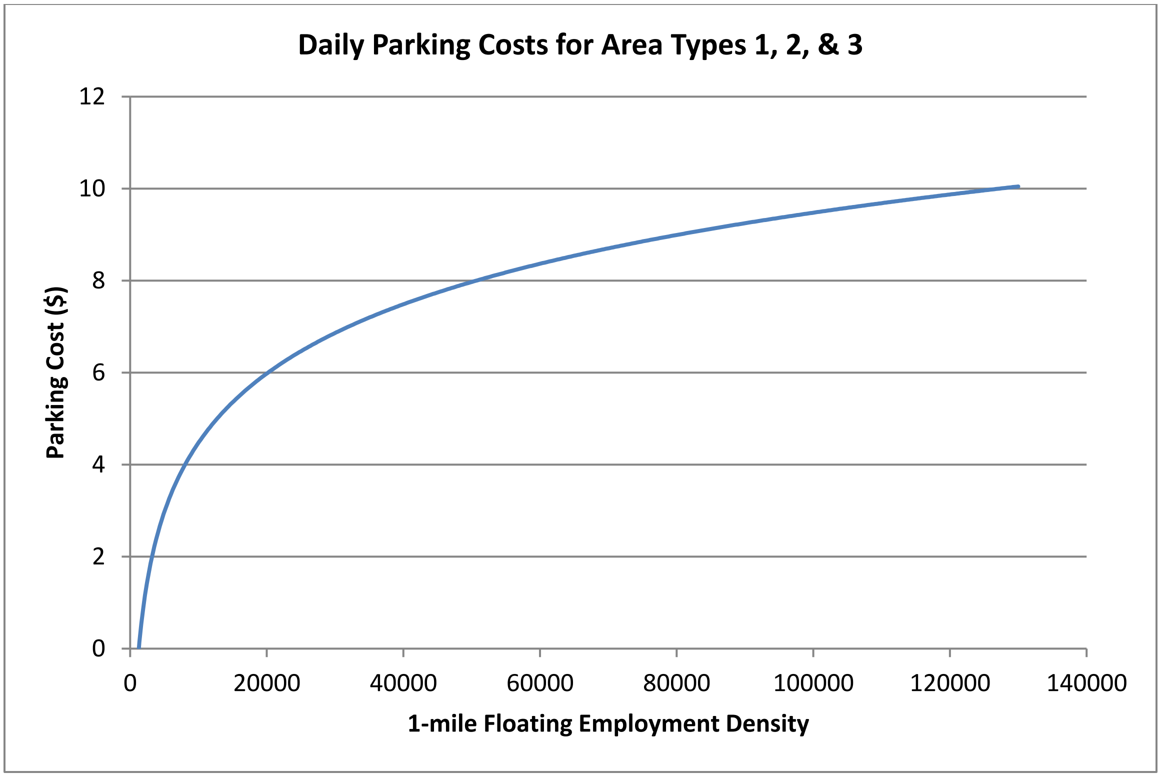

Figure 37 Non-transit-related, daily parking cost model used in the Version 2.3 Model

Ref: I:\ateam\docum\FY11\Ver2.3\modelDoc_v3\02_userGuide\parking_scatterplots.xlsx

For hourly rates, there was insufficient data to estimate a reliable model. Thus, a decision was made to assign a flat rate based on the prevalent metered rates for each area type. For area type 1, the most prevalent metered rate of parking was $2.00 and thus that value was selected. For area type 2, the average hourly parking cost was assumed to be $1.00. For area type 3, the value of $0.25 per hour was selected. For area types 4 and higher, no parking cost was anticipated.

21.7.2 Non-transit-related highway terminal time assumptions

Non-transit-related highway terminal time is typically associated with the average time spent parking or "un-parking" an automobile. The current mode choice model application program considers highway terminal time only at the attraction end. Highway time is calculated as a function of employment density, as shown in Table 83.

Table 83 Non-transit-related highway terminal time as a function of employment density

Employment density range (Emp/Sq. Mi.)	Highway terminal time (minutes)
0 - 4,617	1
4,618 - 6,631	2
6,632 - 11,562	4
11,563 - 32,985	6
32,986 +	8

21.8 Auto Operating Costs

The auto operating cost in the mode choice model relate to out-of-pocket expenditures directly associated with the requirements of an automobile trip, including fuel, oil, maintenance, tire wear, etc. (auto ownership costs including insurance, registration fees are not included). The mode choice model expresses operating costs as a per-mile rate (year-2007 cents) that is specified as a parameter in the nested-logit mode choice model control files. We are currently using 10 cents per mile and this rate is not varied over time (i.e., the auto operating cost for 2016 and 2030 are both assumed to be 10 cents per mile, in year-2007 cents).

22 Time-of-Day Processing

22.1 Overview

The time of day process (page A-9 of the flowchart in Appendix A) is applied to convert daily vehicle trips to time-of-day vehicle trips for the four modeled time periods, prior to being assigned to the network. The process is applied with the *Time-of-Day.s* and *Misc_Time-of-Day.s* scripts. The *Prepare_Trip_Tables_for_Assignment.s* script is used to combine the various trips by time period into combined trip tables for the traffic assignment process. The input and output files are listed in Table 84 and Table 85.

Table 84 Inputs to time-of-day process

Daily Auto Driver Trips, by Occupancy Levels	HBW<ITER>.ADR, HBS<ITER>.ADR, HBO<ITER>.ADR, NHW<ITER>.ADR, NHO<ITER>.ADR	Binary
Daily Miscellaneous and Truck Trips (From the \Inputs subdirectory)	VISI.ADR, TAXI.ADR, SCHL.ADR, AIRPAX.ADR, XXCVT.VTT, XXAUT.VTT,	Binary
Truck and commercial vehicle trip tables	MTK<ITER>.PTT, HTK<ITER>.PTT, COM<ITER>.PTT	Binary
Adjustment or 'delta' trip tables used for commercial and truck models	CVDelta_3722.trp TKDelta_3722.trp	Binary
Time of Day Percent File by Purpose, Mode, and Direction	todcomp_2008HTS.dbf	DBF

Note: <ITER> =PP, i1…i4

Table 85 Outputs of time-of-day process

Trip Tables by Time Period	AM<ITER>.ADR, MD<ITER>.ADR, PM<ITER>.ADR, NT<ITER>.ADR,	Binary
Miscellaneous Time-of-Day Files	MISCAM<ITER>.TT, MISCMD<ITER>.TT, MISCPM<ITER>.TT, MISCNT<ITER>.TT	Binary
Total Vehicle Trips by Six Markets T1 – SOVs T2 – 2 occ. vehicles T3 – 3+ occ. vehicles T4 – Commercial vehicles T5 – Medium + Heavy Trucks Combined T6 – Airport passenger auto-driver trips/vehs.	<ITER>AM.VTT, <ITER>MD.VTT, <ITER>PM.VTT, <ITER>NT.VTT	Binary

23 Traffic Assignment

23.1 Overview

As mentioned in section 2.3 ("Modeling steps and the speed feedback loop"), the Version 2.3 Travel Model uses a user-equilibrium (UE) traffic assignment, which is the generally accepted method for static traffic assignments. The user equilibrium condition was defined by Wardrop in 1952.[127] According to Wardrop's first principle, in the case where all trip makers perceive costs the same way (i.e., no stochastic effects):

> *Under equilibrium conditions, traffic arranges itself in congested networks such that all used routes between an O-D pair have equal and minimum costs, while all unused routes have greater or equal costs.*[128]

Furthermore, the assignment process is a multi-class UE assignment, meaning that separate user classes can be assigned at the same time. The Version 2.3 model includes six user classes:

1. Single-occupant vehicle (SOV)
2. High-occupant vehicle with two persons (HOV2)
3. High-occupant vehicle with three+ persons (HOV3+)
4. Medium and heavy trucks
5. Commercial vehicles
6. Airport passengers traveling to/from the three commercial airports

In Version 2.2, there were only five user classes, since the commercial vehicles category was grouped with medium/heavy truck. The primary reason for distinguishing truck markets is to allow for the option of using passenger car equivalents (PCEs) in the traffic assignment process. The use of PCEs has not yet been implemented, but they will be considered in future developmental work.

Additionally, the Version 2.3 model includes four time-of-day periods for traffic assignment:

- AM peak period (3 hours: 6:00 AM to 9:00 AM)
- Midday period (6 hours: 9:00 AM to 3:00 PM)
- PM peak period (4 hours: 3:00 PM to 7:00 PM)
- Night/early morning period (11 hours: 7:00 PM to 6:00 AM)

Most MPOs use a UE traffic assignment that relies on an optimization algorithm known as the Frank-Wolfe (FW) algorithm.[129] The FW algorithm is essentially a series of all-or-nothing traffic assignments where flows are combined using weights from an optimization process whose goal is to minimize an

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[127] John Glen Wardrop, "Some Theoretical Aspects of Road Traffic Research," *Proceedings of the Institution of Civil Engineers* 1, no. 3 (January 1952): 325–62, https://doi.org/10.1680/ipeds.1952.11259.
[128] Juan de Dios Ortúzar and Luis G. Willumsen, *Modelling Transport*, 2nd ed. (John Wiley & Sons, 1994), 304.
[129] Frank and Wolfe, "An Algorithm for Quadratic Programming."

objective function. The process stops when a stopping criterion is met. Previously, the Version 2.3 Travel Model used the following UE stopping criterion: When the relative gap ≤ 10^{-3} OR the number of UE iterations ≥ 300. The relative gap threshold was always intended to be the primary stopping criterion, with the number of UE iterations functioning as a backup criterion. Now, however, we have moved to what we call a "progressive" relative gap stopping criterion. The idea is that, in the early SFB iterations, the UE closure criterion will be relatively loose, but, in the later SFB iterations, the UE closure criterion will tighten, as shown in Table 6.

Table 86 User equilibrium closure criterion (relative gap) varies by speed feedback iteration

Speed feedback iteration	Primary closure criterion for UE traffic assignment	Secondary closure criteria for UE traffic assignment
Pump prime	Relative gap ≤ 10^{-2} (i.e., 0.01)	Number of UE iterations ≥ 1000
1	Relative gap ≤ 10^{-2} (i.e., 0.01)	Number of UE iterations ≥ 1000
2	Relative gap ≤ 10^{-2} (i.e., 0.01)	Number of UE iterations ≥ 1000
3	Relative gap ≤ 10^{-3} (i.e., 0.001)	Number of UE iterations ≥ 1000
4	Relative gap ≤ 10^{-4} (i.e., 0.0001)	Number of UE iterations ≥ 1000

By using the higher value for UE iterations (1000 vs. 300), we were able to ensure that this secondary criterion is unlikely to be used as the stopping criterion. Based on a series of sensitivity tests,[130] we found that the new progressive relative gap scheme results in a relatively converged traffic assignment, without the extremely lengthy model run times that would be needed if one were to use a high threshold (e.g., 10^{-4} relative gap) for each of the five SFB iterations. The Version 2.3 Travel Model uses a slight variation of the FW algorithm, called the *bi-conjugate* Frank-Wolfe algorithm, which converges marginally faster than the classic FW algorithm.

23.2 Two-step assignment

23.2.1 Prior to 2008: 5 user classes

The Version 2.2 traffic assignment process prior to the fall of 2008 consisted of three separate assignment executions for each speed feedback (SFB) loop: AM peak period, PM peak period, and the off-peak period (see Table 87). To respect the various highway path options and prohibitions in the Washington region, five separate markets or "user classes" (trip tables) were loaded during each assignment execution:

1. Single-occupant vehicles, including commercial vehicles (SOV),
2. 2-occupant vehicles (HOV2),
3. 3+occupant vehicles (HOV3+),
4. Trucks (medium and heavy), and

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[130] Moran and Milone, "Status Report on the Version 2.3 Travel Model: Updates to the Model and Year-2010 Validation," 7–11.

5. Airport passenger vehicles.

Table 87 Traffic assignment in the Version 2.2 Travel Model prior to fall 2008: Three multiclass assignments

For each SFB loop	Assignment period	Trip markets assigned
Assignment 1	AM peak	1. SOV 2. HOV2 3. HOV3+ 4. Trucks 5. Airport passengers
Assignment 2	PM peak	1. SOV 2. HOV2 3. HOV3+ 4. Trucks 5. Airport passengers
Assignment 3	Off-peak	1. SOV 2. HOV2 3. HOV3+ 4. Trucks 5. Airport passengers

In the fall of 2008, as part of air quality conformity work, the traffic assignment process was modified to improve the assignment of HOV/HOT traffic on the Capital Beltway in Virginia and the I-395 Shirley Highway.[131] In the revised process, shown in Table 88, the AM traffic assignment was split into two parts: non-HOV 3+ (i.e., SOV, HOV2, trucks, and airport passengers) and HOV 3+. Similarly, the PM traffic assignment was also split into two parts: non-HOV 3+ and HOV3+. This new traffic assignment process is sometimes referred to as the "two-step assignment," since it splits the AM and PM assignment each into two parts.[132]

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[131] Ronald Milone and Mark S. Moran, "TPB Models Development Status Report" (November 21, 2008).

[132] Jinchul Park to Files, "Two Step Traffic Assignment for HOT Lane Modeling in 2008 CLRP," Memorandum, December 2, 2008.

Table 88 Traffic assignment in the Version 2.2 Travel Model prior to fall 2008: Five multiclass assignments

For each SFB loop	Assignment period	Trip markets assigned
Assignment 1	AM peak (non-HOV3+)	1. SOV 2. HOV2 3. Trucks 4. Airport passengers
Assignment 2	AM peak (HOV3+)	1. HOV3+
Assignment 3	PM peak (non-HOV3+)	1. SOV 2. HOV2 3. Trucks 4. Airport passengers
Assignment 4	PM peak (HOV3+)	1. HOV3+
Assignment 5	Off-peak	1. SOV 2. HOV2 3. HOV3+ 4. Trucks 5. Airport passengers

The result was five (not three) traffic assignments, with either four, one, or five user classes, depending on which assignment was being conducted. The fifth traffic assignment, representing the off-peak period, included all five trip markets (it was only the two peak-period assignments where the non-HOV 3+ and HOV 3+ were split out).

In the first step of the two-step assignment (assignments #1 and #3), non-HOV 3+ traffic (i.e., SOV, HOV 2, truck, and airport passenger trips) is assigned to all facilities (HOV and general purpose). In the second step, HOV 3+ traffic is assigned to HOT lanes and other facilities on the partially loaded network. The pre-assignment of non-HOV 3+ traffic results in congested link speeds for the general-purpose lanes. This means that HOV 3+ traffic has a greater incentive to use HOV facilities, which results in improved HOV 3+ loadings on priority-use and general-use facilities.

23.2.2 After 2008: 6 user classes

Recent versions of the regional travel demand model (e.g., 2.3.52, 2.3.57, 2.3.57a, 2.3.66, 2.3.70 and 2.3.75) continue to use the same two-step assignment, **but there are now six assignments (not five) in each speed feedback loop, since the off-peak period has been split into midday and nighttime**. Also, commercial vehicles are split out from trucks, as shown in Table 89. Note that four of the six traffic assignments are multi-class, but two of the assignments contain only one user class (HOV3+ vehicles in the AM peak and HOV3+ vehicles in the PM peak).

Table 89 Traffic assignment in the Version 2.3.52 and later travel model: Six traffic assignments per speed feedback loop

For each SFB loop	Assignment period	Trip markets assigned
Assignment 1	AM peak (non-HOV3+)	1. SOV 2. HOV2 3. Trucks 4. Commercial vehicles 5. Airport passengers
Assignment 2	AM peak (HOV3+)	1. HOV3+
Assignment 3	PM peak (non-HOV3+)	1. SOV 2. HOV2 3. Trucks 4. Commercial vehicles 5. Airport passengers
Assignment 4	PM peak (HOV3+)	1. HOV3+
Assignment 5	Off-peak, midday	1. SOV 2. HOV2 3. HOV3+ 4. Trucks 5. Commercial vehicles 6. Airport passengers
Assignment 6	Off-peak, nighttime	1. SOV 2. HOV2 3. HOV3+ 4. Trucks 5. Commercial vehicles 6. Airport passengers

23.3 Application details

The traffic assignment process is shown on page A-10 of the flowchart in Appendix A. The *Highway_Assignment_Parallel.bat* batch file calls the *Highway_Assignment_Parallel.s* script. As described in Chapter 8 ("Use of parallel processing to reduce model run times"), the highway assignment process has been "parallelized" by using Cube Cluster (both IDP and MDP), which is Cube's implementation of distributed processing. See section 8.2.1 for terminology related to distributed processing, and see section 8.2.4 for details about how Cube Cluster has been implanted in the Version 2.3.52 model (and later versions, such as 2.3.75), including the traffic assignment step.

23.3.1 Generalized cost

The highway assignment process uses a generalized cost or impedance, which is function of both travel time and cost. Cost is converted to travel time based on the vehicle class and time of day, as described in Table 90. These minutes/per-dollar factors are used for both variably-priced facilities, such as the I-495 HOT lanes in Virginia, and for fixed-price facilities, such as the Governor Nice Bridge.

Table 90 Time Valuation by Vehicle Type and Time Period (minutes/dollar, in year-2007 prices)

Mode	Equivalent Minutes per Dollar AM Peak	Midday	PM Peak	Night
SOV	2.5	3.0	3.0	3.0
HOV 2-occupant auto	1.5	4.0	2.0	4.0
HOV 3+occupant auto	1.0	4.0	1.0	4.0
Light duty commercial vehicle	2.0	2.0	2.0	2.0
Truck	2.0	2.0	2.0	2.0
Auto serving airport passenger	2.0	2.0	2.0	2.0

(Time_Valuation_V2.3.xls)

23.3.2 Inputs and outputs

The inputs and outputs of the *Highway_Assignment_Parallel.s* script are shown in Table 91 and Table 95, respectively.

Table 91 Inputs to traffic assignment process

Volume delay parameters and free-flow speed assumptions	support\hwy_assign_Conical_VDF.s support\hwy_assign_capSpeedLookup.s	Script block
Total vehicle trips by 4 time-of-day periods and 6 user classes	<ITER>_AM.VTT, <ITER>_MD.VTT, <ITER>_PM.VTT, <ITER>_NT.VTT	Binary
Toll minutes equivalence file	support\toll_minutes.txt	Text
AM Toll Factors by Vehicle Type	Inputs\AM_Tfac.dbf	DBF
Midday Toll Factors by Vehicle Type	Inputs\MD_Tfac.dbf	DBF
PM Toll Factors by Vehicle Type	Inputs\PM_Tfac.dbf	DBF
Night Toll Factors by Vehicle Type	Inputs\NT_Tfac.dbf	DBF
Network files	ZONEHWY.NET, <ITER>_HWY.NET	Binary

Note: <ITER> =PP, i1…i4

Table 92 is a lookup table showing highway link capacities in free-flow conditions (vehicles per hour per lane). Table 93 is a lookup table showing highway link speeds in free-flow conditions (mph).

Table 92 Lookup table: Highway link capacities in free-flow conditions (vehicles per hour per lane)

		Area Type **1**	**2**	**3**	**4**	**5**	**6**
0	**Centroid Connectors**	3150	3150	3150	3150	3150	3150
1	**Freeways**	1900	1900	2000	2000	2000	2000
2	**Major Arterials**	600	800	960	960	1100	1100
3	**Minor Arterials**	500	600	700	840	900	900
4	**Collectors**	500	500	600	800	800	800
5	**Expressways**	1100	1200	1200	1400	1600	1600
6	**Ramps**	1000	1000	1000	1000	2000	2000

Ref: "I:\ateam\docum\fy19\tpb_tdfm_gen2\ver2.3\travel_model_user_guide\ver2.3.75_highway_link_lookupTables_capacity_speed.xlsx"

Table 93 Lookup table: Highway link speeds in free-flow conditions (mph)

		Area Type					
		1	**2**	**3**	**4**	**5**	**6**
0	**Centroid Connectors**	15	15	20	25	30	35
1	**Freeways**	55	55	60	60	65	65
2	**Major Arterials**	35	35	45	45	50	50
3	**Minor Arterials**	35	35	40	40	40	45
4	**Collectors**	30	30	30	35	35	35
5	**Expressways**	45	45	50	50	50	55
6	**Ramps**	20	20	30	30	35	50

Ref: "I:\ateam\docum\fy19\tpb_tdfm_gen2\ver2.3\travel_model_user_guide\ver2.3.75_highway_link_lookupTables_capacity_speed.xlsx"

23.3.3 Multi-class assignment

As noted earlier, TPB travel forecasting model Ver. 2.3.52 (and later, including Ver. 2.3.75) perform six traffic assignments per speed feedback iteration (see Table 89). Four of these are multi-class assignments and two of them are single-class assignments. For the multi-user class assignments, two have five user classes (i.e., AM peak non-HOV3+ and PM peak non-HOV3+) and two have six user classes (i.e., midday and nighttime). The Cube Voyager PATHLOAD command is used to perform a traffic assignment, i.e., to load trips to a minimum-impedance path. For each of the traffic assignments, the number of PATHLOAD statements corresponds to the number of user classes (five or six, depending on the assignment). To perform a multi-user class assignment in Cube Voyager, a script must follow two steps:

1. First, in the LINKREAD phase, assign one or more links to a user group. To to this, one primarily uses the ADDTOGROUP (or ADDTOGRP) command, which sets group codes for a link.[133] Generally, one also makes use of link codes that indicate which vehicles are allowed or limited, such as our link LIMIT codes, whose values are shown in Table 94.
2. Second, when performing the traffic assignment with the PATHLOAD statement, one can then specify which groups are to be excluded from the particular traffic assignment.

Table 94 Link limit code, traffic assignment add group, and its meaning

Link Limit Code	Link Add Group	Definition
1	1	All vehicles accepted
2	2	Only HOV2 (or greater) vehicles accepted
3	3	Only HOV3 (or greater) vehicles accepted

---

[133] ADDTOGROUP is a subkey word of SETGROUP, although the key word SETGROUP does not need to appear in the script.

4	4	Medium and heavy trucks are not accepted, but all other traffic is accepted
5	5	Airport passenger vehicle trips
6-8	6	(Unused)
9	7	No vehicles are accepted

So, for example, links that should be restricted to HOV2+ traffic can be added to group 2:

```
PHASE=LINKREAD
       IF (LI.@PRD@LIMIT==2) ADDTOGROUP=2
```

Then, when performing the traffic assignment with the PATHLOAD statement for HOV2+ trips, one can use the EXCLUDEGROUP command like this:

```
PATHLOAD PATH=LW.HV2@PRD@IMP,  EXCLUDEGROUP=3,5,6,7,    VOL[2]=MI.1.2   ;  HOV 2
```

This means that HOV2 trips are excluded from using links that have been added to link groups 3 (HOV3+), 5 (airport passenger vehicles), 6 (unused), and 7 (unused).

23.3.4 Volume-delay functions

The Version 2.3 uses conical volume-delay functions (VDFs). More information about these VDFs can be found on pp. 8-13 to 8-17 of the calibration report dated 1/20/12.[134]

23.3.5 Convergence of user equilibrium traffic assignment

When the traffic assignment process is run, the script creates a series of user equilibrium convergence report files, as shown in Table 95. Each file contains the relative gap by user equilibrium iteration. By using these files with a spreadsheet, one can make plots of the rate of convergence of the traffic assignment.

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[134] Milone et al., "Calibration Report for the TPB Travel Forecasting Model, Version 2.3."

Table 95 Outputs of traffic assignment process

Loaded-link files by time period	<ITER>_am_load_link.asc, <ITER>_md_load_link.asc, <ITER>_pm_load_link.asc, <ITER>_nt_load_link.asc,	Text
Loaded Highway Network	<ITER>_ Assign_output.net	Binary
UE convergence report files	<iter>_ue_iteration_report_AM_nonHov.txt <iter>_ue_iteration_report_AM_hov.txt <iter>_ue_iteration_report_PM_nonHov.txt <iter>_ue_iteration_report_PM_hov.txt <iter>_ue_iteration_report_MD.txt <iter>_ue_iteration_report_NT.txt	Text

Note: <ITER> =PP, i1…i4

23.3.6 Loaded link highway network

Table 96 provides further details regarding the attributes of the final loaded highway network.

Table 96 Variables included in the final iteration, loaded highway network (i4_Assign_output.net)

Variable Name	Description
A	A-Node
B	B-Node
DISTANCE	Link Distance in miles (x.xx)
SPDC	(Not used)
CAPC	(Not used)
JUR	Jurisdiction Code (0-23) *0/dc, 1/mtg, 2/pg, 3/alr/, 4/alx,5, ffx, 6/ldn, 7/ pw, 8/(unused), 9/ frd, 10/how, 11/aa, 12/chs, 13/(unused), 14/car, 15/cal, 16/stm, 17/ kg, 18/fbg, 19/stf, 20/spts, 21/fau, 22/clk, 23/jef*
SCREEN	Screenline Code (1-38)
FTYPE	Link Facility Type Code (0-6)
	0/Centroids, 1/Freeways, 2/Major Art., 3/Minor Art, 4/Collector, 5/Expressway, 6/Ramp
TOLL	Toll Value in current year dollars
TOLLGRP	Toll Group Code (1-9999)
<Period> LANE	<Period> No. of Lanes
<Period>LIMIT	<Period> Limit Code (0-9)
EDGEID	Geometry network link identifier
LINKID	Logical network link identifier
NETWORKYEA	Planning year of network link
SHAPE_LENG	Geometry length of network link (in feet)
PROJECTID	Project identifier
TAZ	Nearest TAZ centroid to midpoint of link (1-3,722)
ATYPE	Area Type (1-6)
SPDCLASS	Speed Class

CAPCLASS	Capacity Class
DEFLATIONFTR	Factor for deflating current year tolls to constant year tolls
<Period>TOLL	<Period> Toll Value in current year dollars - all tolled facilities
<Period>TOLL_VP	<Period> Toll Value in current year dollars - Variably priced tolled facilities only
<Period> HTIME	<Period> Highway Time - based on initial highway lookup speeds
I4<Period>SOV	Iteration 4 <Period> assigned SOV Volume
I4<Period>HV2	Iteration 4 <Period> assigned HOV2 Volume
I4<Period>HV3	Iteration 4 <Period> assigned HOV3 Volume
I4<Period>CV	Iteration 4 <Period> assigned Commercial Vehicle Volume
I4<Period>TRK	Iteration 4 <Period> assigned Truck Volume
I4<Period>APX	Iteration 4 <Period> assigned Airport Passenger Volume
I4<Period> VOL	Iteration 4 <Period> assigned Volume
I4<Period>VMT	Iteration 4 <Period> Vehicle Miles Travelled (VMT)
I4<Period>FFSPD	Iteration 4 <Period> free flow speed (mph)
<Period>HRLKCAP	<Period> hourly link capacity
<Period>HRLNCAP	<Period> hourly lane capacity
I4<Period>VC	Iteration 4 <Period> Volume Capacity ratio
I4<Period>VDF	Iteration 4 <Period> Volume Delay function
I4<Period>SPD	Iteration 4 <Period> Speed (mph)
I424VOL	Iteration 4 Daily (24 hour) Volume

KEY <Period>= AM	AM Peak Period (6:00-9:00 AM)
MD	Mid Day (9:00 AM - 3:00 PM)
PM	PM Peak Period (3:00 - 7:00 PM)
NT	All remaining hours

23.3.7 Averaging of link volumes

Since the travel model includes speed feedback, in order to ensure that highway volumes and hence speeds are stabilizing with each successive speed feedback iteration, it is necessary to apply a link-level "method of successive averaging" (MSA) process. The MSA averaging is performed on the basis of total (non-segmented) link volumes, and is performed individually for each time period. This process is performed after each successive highway assignment process using the *Average_Link_Speeds.bat* file that includes the *Average_Link_Speeds.s* script. This script uses the current iteration and previous iteration loaded networks to develop a network with volume averaging named <ITER>_HWY.net.

23.3.8 Treatment of airport passenger auto driver trips on HOV and HOT lane facilities

Text for this section of the report come from or are derived from a recent memo on this subject.[135]

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[135] Dusan Vuksan, Dzung Ngo, and Mark S. Moran, "Air Passenger Trips on HOV/HOT Lanes in the TPB Version 2.3 Travel Model: Discussion of Current Treatment and Recommendations for Modifications," Memorandum, April 24, 2017.

The terms "airport passenger trips" or "air passenger trips" refer to a motor vehicle carrying air passengers to or from one of the three commercial airports in the region: Reagan National (DCA), Dulles International (IAD), and Baltimore-Washington International (BWI). The focus is on highway assignment, not mode choice or transit assignment.

23.3.8.1 Real world conditions

Regarding the use of HOV and HOT-lane facilities by motor vehicles carrying air passengers, there are several real-world issues that increase the difficulty of reflecting these usage restrictions in the travel model. First, there are many different HOV and HOT facilities with different restrictions on their use, as shown in Table 97. The information in this table does not even address airport passenger trips.

Table 97 HOV and HOT-lane facilities in the Washington, D.C. area

Type of Facility	Use Restrictions	Examples
HOV2+	Vehicles must have two or more occupants (certain exemptions apply, including an airport-related exemption)	I-270, I-66, US 50 (MD)
HOV3+	Vehicles must have three or more occupants.	I-395, I-95 (VA)
HOT2+	Vehicles with two or more occupants can use the facility for free. Vehicles with one occupant may pay to use the facility. Users of the facility must have either an "E-Zpass" OR "E-ZPass Flex" tag/RFID transponder in vehicle. Users who want to gain free access to the facility due to meeting the occupancy requirement must have an "E-ZPass Flex" transponder.	I-66 Inside the Beltway after 2018
HOT3+	Vehicles with three or more occupants can use the facility for free. Vehicles with one or two occupants may pay to use the facility. Users of the facility must have either an "E-Zpass" OR "E-ZPass Flex" tag/RFID transponder in vehicle. Users who want to gain free access to the facility due to meeting the occupancy requirement must have an "E-ZPass Flex" transponder.	I-495 (VA), I-395 after 2019

Second, there is an important exception to the HOV occupancy rules regarding one HOV facility for air passenger auto trips to/from one of the three commercial airports:

> *Motorists traveling to and from Dulles International Airport to go to the airport to board a flight or to pick someone up at the airport are permitted to use I-66 inside the Beltway (I-495) during HOV hours. Motorists traveling to or from Dulles International Airport are not exempt from HOV restrictions on I-66 outside the Beltway (I-495). You are not permitted to use I-66 inside the beltway during HOV hours if you are going to the airport to eat, get coffee, get gas or any other reason other than boarding a plane or picking someone up at the airport.*[136]

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[136] "High Occupancy Vehicle (HOV) Lanes - Rules and FAQs," Virginia Department of Transportation, February 1, 2017, http://www.virginiadot.org/travel/hov-rulesfaq.asp.

Third, the exemption for travelers to/from Dulles Airport will end when the I-66 Inside the Beltway HOT lanes open (ca. December 2017).[137]

23.3.8.2 Treatment in the Ver. 2.3 travel model

Before discussing how the model handles air passenger travel on HOV and HOT-lane facilities, this section of the report discusses the general way in which air passenger trips are handled in the travel demand model. Although air passenger travel on the road network is handled by the travel model, it is considered an exogenous input to the model. Other exogenous inputs to the travel model include taxi trips, visitor/tourist trips, school trips, through trips, and external trips. As noted in a recent memo:[138]

> *The airport passenger auto driver trip tables are prepared on the basis of base- and future-year trip tables that are developed as part of COG’s Air System’s Planning activities. The trip tables indicate local originations to the three major commercial airports in the modeled region by mode and purpose (Home-Based and Non-Home-Base). The trip tables are developed by year and are prepared at the Airport Analysis Zone (AAZ) level of geography. (p. 13).*

Airport passenger trips are stored in a binary trip-table file called airpax.adr. The current air passenger auto driver trip tables were developed using the COG 2011 Regional Air Passenger Survey, not the more recent 2013 survey, since TPB staff felt it would be inappropriate to use the 2013 survey since it was conducted during an unexpected federal shutdown known as the sequester.[139]

In terms of the treatment of air passenger trips on HOV and HOT-lane facilities, the Ver. 2.3.70 model (and earlier) allowed airport trips to use any HOV facility regardless of the vehicle occupancy. For the HOV2+ lanes on I-66 Inside the Beltway, **this makes sense**, given the current policy for I-66 mentioned earlier. For other HOV facilities in the region, however, the model’s representation does not reflect the real transportation system. For these other HOV facilities, vehicles carrying air passengers should be allowed to use the other HOV facilities only if the vehicles meet the occupancy requirements for the facility.

Table 98 shows how airport passenger trips are treated with respect to HOV facilities in the real world, the Ver. 2.3.66 model, and the Ver. 2.3.75 model (the same as the Ver. 2.3.70). The three areas highlighted in yellow show where there was a mismatch between the real world and the Ver. 2.3.66 model.

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[137] Robert Thomson, “As Virginia Sets up I-66 HOT Lanes, Drivers Again Ask: What about Me?,” The Washington Post, August 16, 2016, https://www.washingtonpost.com/news/dr-gridlock/wp/2016/08/11/as-virginia-sets-up-i-66-hot-lanes-drivers-again-ask-what-about-me/.

[138] Ronald Milone to DTP Technical Staff, “Round 9.1-Based Exogenous Demand Inputs to the Travel Model,” Memorandum, April 23, 2018.

[139] Milone to DTP Technical Staff.

Table 98 Use of HOV and HOT-lane facilities by autos serving airport passengers: Real world, Ver. 2.3.66 model, and Ver. 2.3.75 model

Auto Serving Airport Passenger (no. of occupants)		**HOV Facility**			**HOT-Lane Facility**		
	Case	**2+**	**2+ I-66 Inside Beltway**	**3+**	**2+**	**2+ I-66 Inside Beltway**	**3+**
1 occupant	**Real World**	**No**	**Yes, VDOT exemption (1)**	**No**	**Yes (pay toll)***	**Yes (pay toll)* (2)**	**Yes (pay toll)***
	V. 2.3.66 Model	Yes	Yes	Yes	Yes (pay toll)	Yes (pay toll)	Yes (pay toll)
	V. 2.3.75 Model	Yes	Yes	No	Yes (pay toll)	Yes (pay toll)	Yes (pay toll)
2 occupants	**Real World**	**Yes**	**Yes**	**No**	**Yes (free)****	**Yes (free)****	**Yes (pay toll)***
	V. 2.3.66 Model	Yes	Yes	Yes	Yes (pay toll)	Yes (pay toll)	Yes (pay toll)
	V. 2.3.75 Model	Yes	Yes	No	Yes (pay toll)	Yes (pay toll)	Yes (pay toll)
3+ occupants	**Real World**	**Yes**	**Yes**	**Yes**	**Yes (free)****	**Yes (free)****	**Yes (free)****
	V. 2.3.66 Model	Yes	Yes	Yes	Yes (pay toll)	Yes (pay toll)	Yes (pay toll)
	V. 2.3.75 Model	Yes	Yes	No	Yes (pay toll)	Yes (pay toll)	Yes (pay toll)

(1): Per VDOT: “Motorists traveling to and from Dulles International Airport to go to the airport to board a flight or to pick someone up at the airport are permitted to use I-66 inside the Beltway (I-495) during HOV hours. Motorists traveling to or from Dulles International Airport are not exempt from HOV restrictions on I-66 outside the Beltway (I-495). You are not permitted to use I-66 inside the beltway during HOV hours if you are going to the airport to eat, get coffee, get gas or any other reason other than boarding a plane or picking someone up at the airport.” (Source: “High Occupancy Vehicle (HOV) Lanes - Rules and FAQs.” *Virginia Department of Transportation*, February 1, 2017. http://www.virginiadot.org/travel/hov-rulesfaq.asp).

(2): Exemption for travelers to/from Dulles Airport will end when the I-66 Inside the Beltway HOT lanes open (Source: Thomson, Robert. “As Virginia Sets up I-66 HOT Lanes, Drivers Again Ask: What about Me?” *The Washington Post*. August 16, 2016. https://www.washingtonpost.com/news/dr-gridlock/wp/2016/08/11/as-virginia-sets-up-i-66-hot-lanes-drivers-again-ask-what-about-me/)

* Must have an “E-Zpass” OR “E-ZPass Flex” tag/RFID transponder in vehicle.

** Must have an “E-ZPass Flex” tag/RFID transponder in vehicle.

The only change made to the travel model (Ver. 2.3.75) regarding modeling airport trips was to prohibit airport trips from using HOV3+ facilities, since observed car occupancy for these types of trips is approximately 1.6 persons per vehicle, which is calculated from the Average Weekday Air Passenger Ground Access trip data documented in the 2013 Washington – Baltimore Regional Air Passenger Survey. These three areas are highlighted in green in Table 98.

24 Transit Assignment, Including Summary Process (LineSum)

24.1 Transit assignment process

Transit assignment is a new feature of the Version 2.3 Travel Model that was not part of the Version 2.2 Travel Model. Transit assignment is where transit trips are loaded on to the transit network. Although highway and transit assignment have some similarities, it is useful to point out some of the differences between these two assignment procedures. First, whereas highway assignment is done with trip tables in origin/destination (O/D) format, transit assignment is done with trip tables in production/attraction (P/A) format. Second, whereas highway assignment is capacity constrained, transit assignment is not. Lastly, whereas highway assignment is done in each of the five speed feedback loops (i.e., pump prime, i1, i2, i3, and i4), transit assignment is conducted only at the conclusion of the i4 speed feedback loop (See Figure 9 and Figure 10).

Procedures for transit assignment are shown on pages A-15 through A-17 in the flowchart in Appendix A. The transit assignment is run using the *Transit_Assignment_Parallel.bat* and *Transit_Assignment_LineHaul_Parallel.bat* batch files, the first of which is called from the "run model steps" batch file. Prior to transit assignment, the five mode choice trip tables (HBW, HBS, HBO, NHW, and NHO) are combined into two trip tables (AM = HBW; and OP = HBS + HBO + NHW + NHO), using the *Combine_Tables_For_TrAssign_Parallel.s* script. After the transit assignment has been run, the transit assignment output files are summarized using the LineSum program. This is also called from the *Transit_Assignment_Parallel.bat* batch file via the *TranSum.bat* batch file. The transit assignment process is run in the standard scenario/output folder (e.g., 2016_Final), but the transit assignment summary files are stored in a sub-folder called "transum." The inputs to the *Transit_Assignment_Parallel.bat* batch file are shown in Table 99 and the outputs are shown in Table 100.

Table 99 Inputs to transit assignment process

Trip tables segmented by mode (coming from the mode choice model)	i4_HBW_NL_MC.MTT i4_HBS_NL_MC.MTT i4_HBO_NL_MC.MTT i4_NHW_NL_MC.MTT i4_NHO_NL_MC.MTT	Binary
Highway network	Zonehwy.net	Binary
AM peak transit lines	Inputs\MODE1AM…MODE10AM.TB	Text
Off peak transit lines	Inputs\MODE1OP…MODE10OP.TB	Text
Transit network files	met_node.tb, met_bus.tb, met_link.tb, com_node.tb, com_bus.tb, com_link.tb, lrt_node.tb, lrt_bus.tb, lrt_link.tb new_node.tb, new_bus.tb, new_link.tb met_pnrn.tb, com_pnrn.tb, bus_pnrn.tb, lrt_pnrn.tb, new_pnrn.tb met_[AM|OP] _pnr.tb, com_ [AM|OP] _pnr.tb, bus_ [AM|OP] _pnr.tb, lrt_ [AM|OP] _pnr.tb, new_ [AM|OP] _pnr.tb met_[AM|OP] _pnr.asc, com_ [AM|OP] _pnr.asc, bus_ [AM|OP] _pnr.asc, lrt_ [AM|OP] _pnr.asc, new_ [AM|OP] _pnr.asc met_[AM|OP] _knr.asc, bus_ [AM|OP] _knr.asc, lrt_ [AM|OP] _knr.asc, new_ [AM|OP] _knr.asc met_bus.tb, com_bus.tb, lrt_bus.tb, new_bus.tb	Text
Transit network walk links	walkacc.asc, sidewalk.asc	Text

Note: <ITER> =PP, i1…i4

Table 100 Outputs of transit assignment process

Combined transit trip file	<ITER>_<Prd>MS.TRP	Binary
Transit assignment node file	<ITER>_*<AA><??><Prd>*node.dbf	DBF
Transit assignment Link file	<ITER>_*<AA><??><Prd>*link.dbf	DBF
Support links	Supl_<??>_*<AA>*_*<Prd>*.asc	Text

Note: <ITER> =PP, i1…i4, <AA>= WK, DR, KR ??= CR, MR, AB, BM, Prd=AM, OP

The transit assignment is done for two time-of-day periods: the peak period and the off peak period. The peak period is represented by the three-hour AM peak period. The off-peak period is represented by the five-hour midday period. Thus, when calculating peak-period travel times on transit ("skims") the AM peak period is used to represent the level of service in both the AM and PM peak period. Similarly, when calculating the average headway and average run time for each transit route, these calculations are done for the peak period (represented by the AM peak) and the off-peak period (represented by the midday period). It is assumed that the majority of HBW trips will occur in the peak periods and that the majority of non-work trips will occur in the off-peak periods. Consequently, prior to the actual transit assignment, the five trip tables coming out of mode choice are combined into two tables: one for the peak period and one for the off-peak period. The peak-period trip table ("AM") contains only one trip table (HBW). By contrast, the off-peak period trip table ("OP") contains the trip tables from the other four trip purposes (HBS, HBO, NHW, NHO) as shown in Table 101.

Table 101 Mapping/concatenation of trip tables by trip purposes into peak and off-peak period trip tables prior to transit assignment

Before combining trip tables	After combining trip tables
i4_HBW_NL_MC.MTT	i4_AMMS.TRP
i4_HBS_NL_MC.MTT i4_HBO_NL_MC.MTT i4_NHW_NL_MC.MTT i4_NHO_NL_MC.MTT	i4_OPMS.TRP

This is mapping/concatenation of trip tables done with the Cube Voyager script *Combine_Tables_For_TrAssign.s* script. There are 11 tables on the *.TRP files, not 12, since, for commuter rail, KNR and PNR are combined:

WK_CR, WK_BUS, WK_BUS_MR, WK_MR,

PNR_KNR_CR, PNR_BUS, KNR_BUS, PNR_BUS_MR, KNR_BUS_MR, PNR_MR, KNR_MR

There are four transit assignment scripts, one for each transit submode (commuter rail, Metrorail, all bus, and bus/Metrorail):

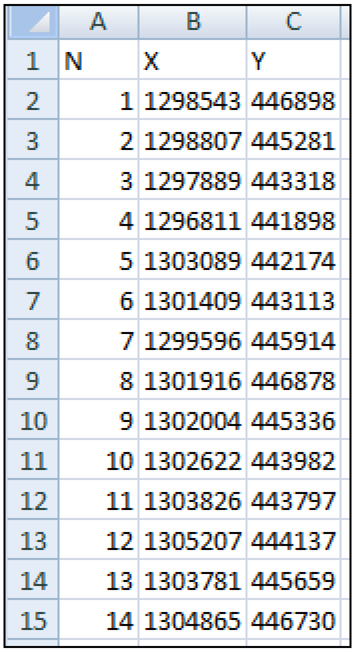
```
transit_assignment_CR.s
transit_assignment_MR.s
transit_assignment_AB.s
transit_assignment_BM.s
```

24.1.1 Inputs to the transit assignment

As can be seen on page A-15 of Appendix A, the specific list of inputs for transit assignment varies for each of the four transit submodes.

24.1.2 Outputs of the transit assignment

The output of the four transit assignment scripts are a series of transit link files and transit node files in dBase (DBF) format. These files are generated in Cube Voyager's TRNBUILD module using the LINKO and NODEO keywords. The transit node files (NODEO) simply contain the node number and its X and Y coordinates, as shown in Figure 38.



	A	B	C
1	N	X	Y
2	1	1298543	446898
3	2	1298807	445281
4	3	1297889	443318
5	4	1296811	441898
6	5	1303089	442174
7	6	1301409	443113
8	7	1299596	445914
9	8	1301916	446878
10	9	1302004	445336
11	10	1302622	443982
12	11	1303826	443797
13	12	1305207	444137
14	13	1303781	445659
15	14	1304865	446730

Figure 38 Excerpt from one of the transit node DBF files output from transit assignment (i4_WKMRAMnode.dbf)

Ref: "X:\modelRuns\fy12\Ver2.3.36\2007_pseu\i4_WKMRAMnode.dbf"

Transit link files (LINKO) files include the following attributes:[140]

- A: A-node of link
- B: B-node of link
- TIME: A-B time (hundredths of minutes)
- MODE: Mode of link (1-255)
- COLOR: User designated drawing color
- STOP_A: 1 = A is a stop node
- STOP_B: 1 = B is a stop node
- DIST: A-B distance (hundredths of miles)
- NAME: Name of line on this link
- FREQ: Service frequency (min)
- PLOT: Always = 0

The following additional attributes are included due to transit assignment:

- SEQ: Link sequence in the line
- OWNER: Line owner (first ten characters)
- AB_VOL: Volume
- AB_BRDA: Number of trip boardings at A
- AB_XITA: Number of exits at A

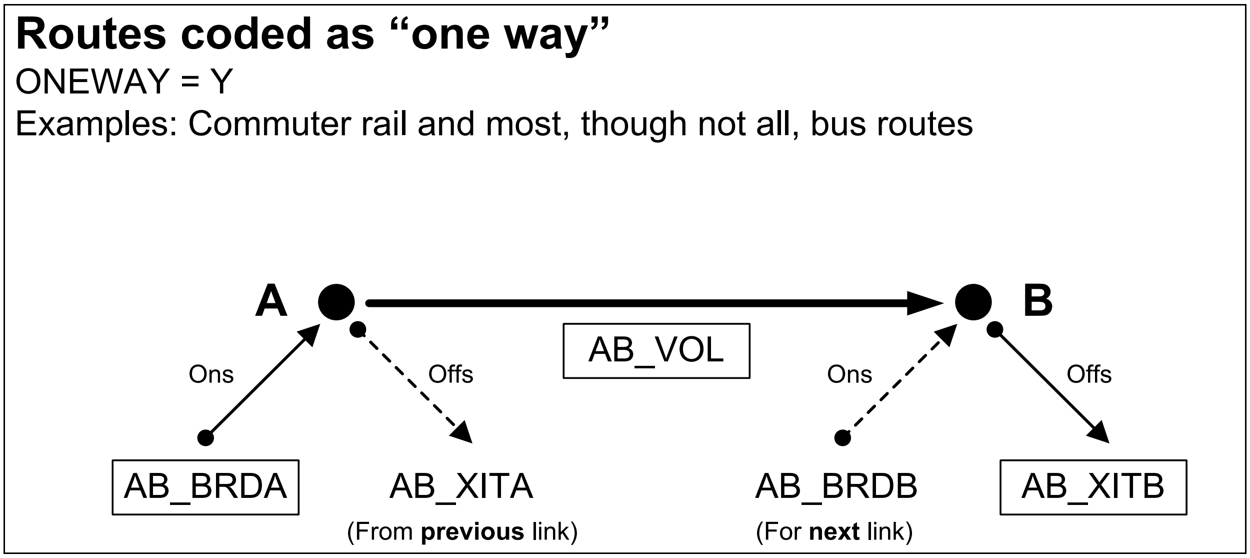
---

[140] Citilabs, Inc., "Cube Voyager Reference Guide, Version 6.0.2" (Citilabs, Inc., July 26, 2012), 958.

- AB_BRDB: Number of boardings at B
- AB_XITB: Number of exits at B
- (last 5 variables are also repeated for B-A direction)

Figure 39 and Figure 40 show the naming conventions used for transit volumes from a TRNBUILD-based transit assignment. Both figures show the associated volumes ("ons," "throughs," and "offs") for a hypothetical transit link AB. Figure 39 is for the case of a one-way transit route, and Figure 40 is for the case of a two-way transit route. These figures can also be useful when interpreting reports from the LineSum transit assignment summary program (covered in the next section of the report).

Figure 39 Transit volumes from transit assignment using TRNBUILD: One-way route



Ref: transit_volumes_ab_ba_trnbuild_v2.vsd

Note: For a description of AB_VOL, AB_BRDA, AB_XITA, etc., see page 1020, Cube Voyager Reference Guide, Version 6.4.1 Citilabs, Inc., September 30, 2015.

The simplest case is the one-way route (Figure 39). In this case, the three important values for the link AB are:

- AB_VOL: Transit person trips on link AB ("throughs")
- AB_BRDA: Transit person boardings ("ons") at the "from" node (node A in the figure)
- AB_XITB: Transit person alightings ("offs") from the "to" node (node B in the figure)

All three of these variables are shown in rectangular boxes in Figure 39. The other two values shown in Figure 39 (AB_XITA and AB_BRDB) are associated with the **link prior to link AB** (AB_XITA) and the **link after link AB** (AB_BRDB).

For routes coded as two-way (Figure 40), the situation is similar, but a bit more complex. When traveling in the A-to-B direction, the three important variables for transit volumes are the same as before:

- AB_VOL: Transit person trips on link AB ("throughs")

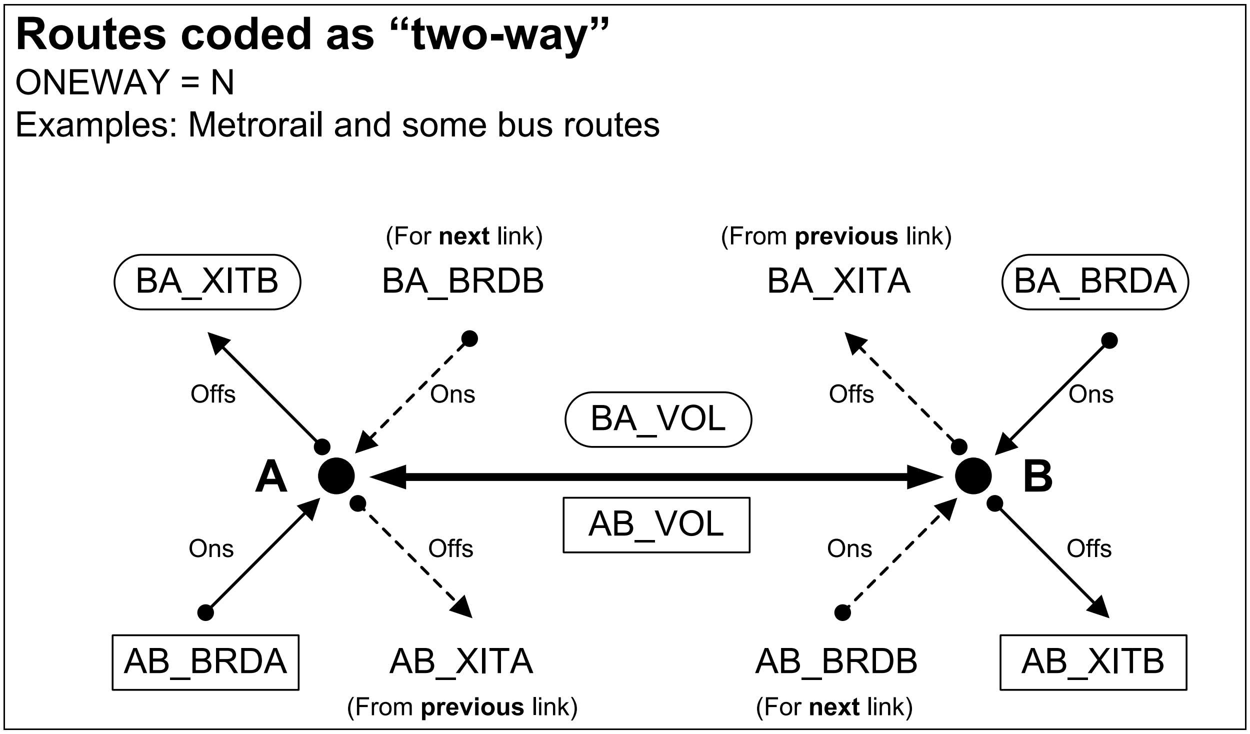
- AB_BRDA: Transit person boardings ("ons") at the "from" node (node A in the figure)
- AB_XITB: Transit person alightings ("offs") from the "to" node (node B in the figure)

However, when travelling in the B-to-A direction, the three relevant variables are:

- BA_VOL: Transit person trips on link AB in the B-to-A direction ("throughs")
- BA_BRDA: Transit person boardings ("ons") in the B-to-A direction at the "from" node (node B in the figure)[141]
- BA_XITB: Transit person alightings ("offs") in the B-to-A direction from the "to" node (node A in the figure)

These are indicated in Figure 40 with rectangular boxes that have rounded corners.

Figure 40 Transit volumes from transit assignment using TRNBUILD: Two-way route



Ref: transit_volumes_ab_ba_trnbuild_v2.vsd

Note: For a description of AB_VOL, AB_BRDA, AB_XITA, etc., see page 1020, Cube Voyager Reference Guide, Version 6.4.1 Citilabs, Inc., September 30, 2015.

Keep in mind that, since transit path-building and assignment are conducted in production/attraction (P/A) format, **all of the values on these tables are also in P/A format**. Conducting transit assignment in production/attraction format is state of the practice for transit assignments and has the benefit of

---

[141] Typically, the convention is that the "from" node is the A node and the "to" node is the B node. However, in Figure 40, for movement in the B-to-A direction, the "from" node is labeled B and the "to" node is labeled A, since those were the labels used for movement in the A-to-B direction.

showing the peak orientation of the transit line. **To estimate the boardings at a given station in origin/destination format, you need to add the "ons" and "offs" together and divide by two**.[142]

Some examples of the LINKO attribute values can be found in Figure 41 through Figure 43. For example, Figure 41 shows a portion of the AM walk-access to Metrorail LINKO file (i4_WKMRAMlink.dbf) that has mode-16 links (walk access to transit). Similarly, Figure 42 shows a portion of the AM walk-access to Metrorail LINKO file (i4_WKMRAMlink.dbf) that has mode-3 links (Metrorail line segments). Lastly, Figure 43 shows a portion of the AM walk-access to Metrorail LINKO file (i4_WKMRAMlink.dbf) that has mode-12 links (walk transfer links).

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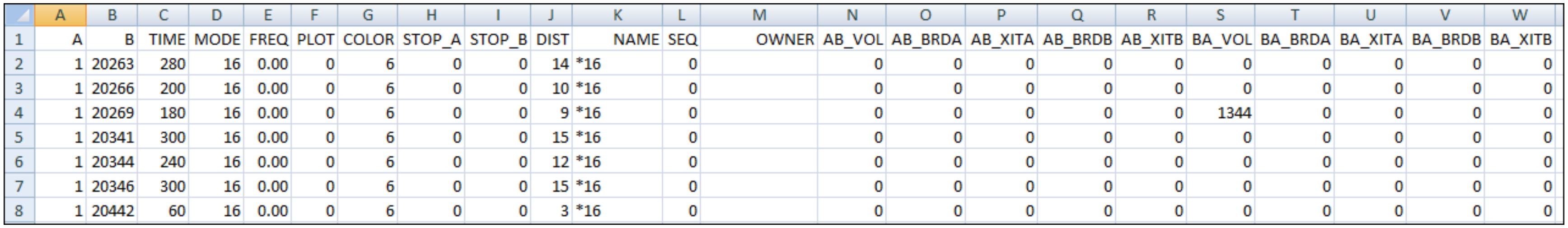
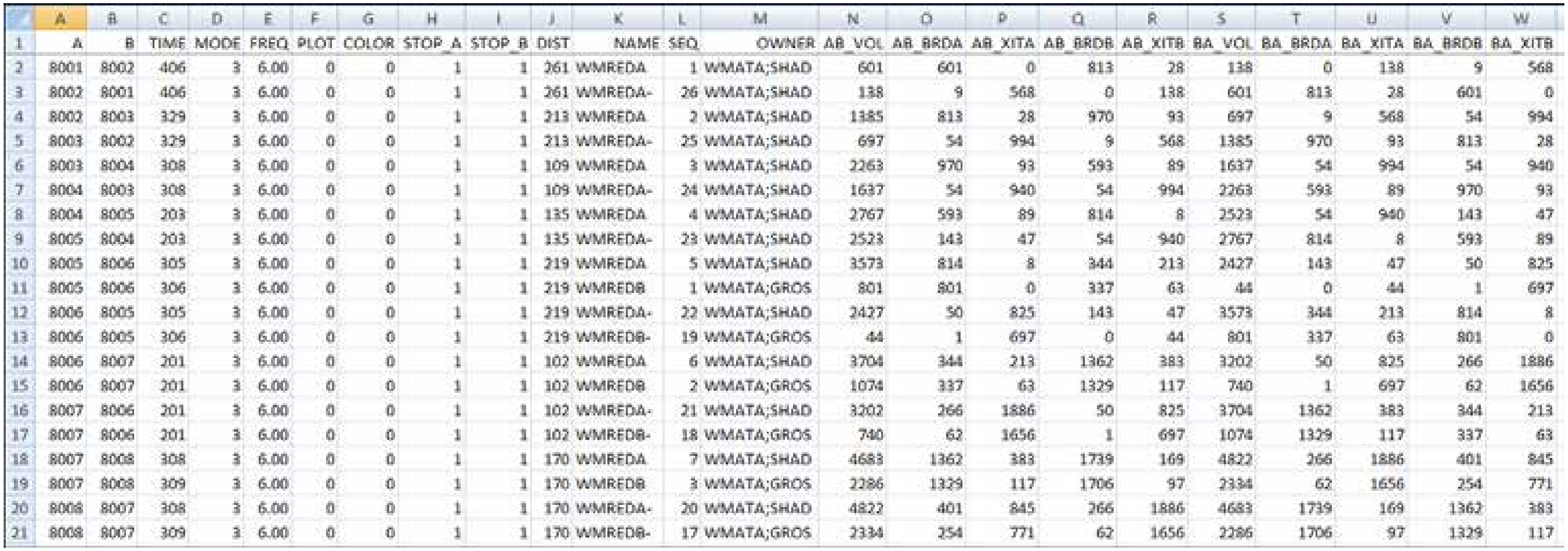
[142] AECOM, "LineSum (Version 5.0.17)" (Arlington, Virginia: AECOM, June 13, 2012), 14.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	A	B	TIME	MODE	FREQ	PLOT	COLOR	STOP_A	STOP_B	DIST	NAME	SEQ	OWNER	AB_VOL	AB_BRDA	AB_XITA	AB_BRDB	AB_XITB	BA_VOL	BA_BRDA	BA_XITA	BA_BRDB	BA_XITB
2	1	20263	280	16	0.00	0	6	0	0	14	*16	0		0	0	0	0	0	0	0	0	0	0
3	1	20266	200	16	0.00	0	6	0	0	10	*16	0		0	0	0	0	0	0	0	0	0	0
4	1	20269	180	16	0.00	0	6	0	0	9	*16	0		0	0	0	0	0	1344	0	0	0	0
5	1	20341	300	16	0.00	0	6	0	0	15	*16	0		0	0	0	0	0	0	0	0	0	0
6	1	20344	240	16	0.00	0	6	0	0	12	*16	0		0	0	0	0	0	0	0	0	0	0
7	1	20346	300	16	0.00	0	6	0	0	15	*16	0		0	0	0	0	0	0	0	0	0	0
8	1	20442	60	16	0.00	0	6	0	0	3	*16	0		0	0	0	0	0	0	0	0	0	0

Figure 41 Excerpt from one of the transit link DBF files output from transit assignment (i4_WKMRAMlink.dbf) showing mode-16 links

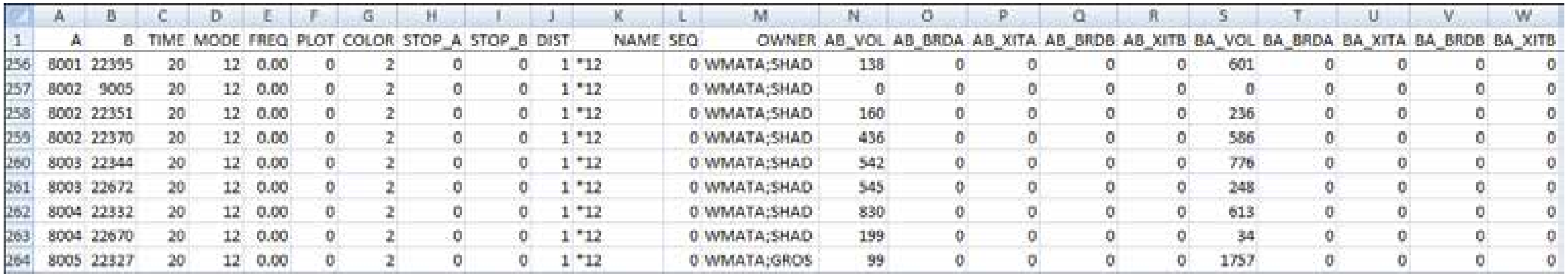
Ref: "X:\modelRuns\fy12\Ver2.3.36\2007_pseu\i4_WKMRAMlink.dbf"



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	A	B	TIME	MODE	FREQ	PLOT	COLOR	STOP_A	STOP_B	DIST	NAME	SEQ	OWNER	AB_VOL	AB_BRDA	AB_XITA	AB_BRDB	AB_XITB	BA_VOL	BA_BRDA	BA_XITA	BA_BRDB	BA_XITB
2	8001	8002	406	3	6.00	0	0	1	1	261	WMREDA	1	WMATA;SHAD	601	601	0	813	28	138	0	138	9	568
3	8002	8001	406	3	6.00	0	0	1	1	261	WMREDA-	26	WMATA;SHAD	138	9	568	0	138	601	813	28	601	0
4	8002	8003	329	3	6.00	0	0	1	1	213	WMREDA	2	WMATA;SHAD	1385	813	28	970	93	697	9	568	54	994
5	8003	8002	329	3	6.00	0	0	1	1	213	WMREDA-	25	WMATA;SHAD	697	54	994	9	568	1385	970	93	813	28
6	8003	8004	308	3	6.00	0	0	1	1	109	WMREDA	3	WMATA;SHAD	2263	970	93	593	89	1637	54	994	54	940
7	8004	8003	308	3	6.00	0	0	1	1	109	WMREDA-	24	WMATA;SHAD	1637	54	940	54	994	2263	593	89	970	93
8	8004	8005	203	3	6.00	0	0	1	1	135	WMREDA	4	WMATA;SHAD	2767	593	89	814	8	2523	54	940	143	47
9	8005	8004	203	3	6.00	0	0	1	1	135	WMREDA-	23	WMATA;SHAD	2523	143	47	54	940	2767	814	8	593	89
10	8005	8006	305	3	6.00	0	0	1	1	219	WMREDA	5	WMATA;SHAD	3573	814	8	344	213	2427	143	47	50	825
11	8005	8006	306	3	6.00	0	0	1	1	219	WMREDB	1	WMATA;GROS	801	801	0	337	63	44	0	44	1	697
12	8006	8005	305	3	6.00	0	0	1	1	219	WMREDA-	22	WMATA;SHAD	2427	50	825	143	47	3573	344	213	814	8
13	8006	8005	306	3	6.00	0	0	1	1	219	WMREDB-	19	WMATA;GROS	44	1	697	0	44	801	337	63	801	0
14	8006	8007	201	3	6.00	0	0	1	1	102	WMREDA	6	WMATA;SHAD	3704	344	213	1362	383	3202	50	825	266	1886
15	8006	8007	201	3	6.00	0	0	1	1	102	WMREDB	2	WMATA;GROS	1074	337	63	1329	117	740	1	697	62	1656
16	8007	8006	201	3	6.00	0	0	1	1	102	WMREDA-	21	WMATA;SHAD	3202	266	1886	50	825	3704	1362	383	344	213
17	8007	8006	201	3	6.00	0	0	1	1	102	WMREDB-	18	WMATA;GROS	740	62	1656	1	697	1074	1329	117	337	63
18	8007	8008	308	3	6.00	0	0	1	1	170	WMREDA	7	WMATA;SHAD	4683	1362	383	1739	169	4822	266	1886	401	845
19	8007	8008	309	3	6.00	0	0	1	1	170	WMREDB	3	WMATA;GROS	2286	1329	117	1706	97	2334	62	1656	254	771
20	8008	8007	308	3	6.00	0	0	1	1	170	WMREDA-	20	WMATA;SHAD	4822	401	845	266	1886	4683	1739	169	1362	383
21	8008	8007	309	3	6.00	0	0	1	1	170	WMREDB-	17	WMATA;GROS	2334	254	771	62	1656	2286	1706	97	1329	117

Figure 42 Excerpt from one of the transit link DBF files output from transit assignment (i4_WKMRAMlink.dbf) showing mode-3 links

Ref: "X:\modelRuns\fy12\Ver2.3.36\2007_pseu\i4_WKMRAMlink.dbf"



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	A	B	TIME	MODE	FREQ	PLOT	COLOR	STOP_A	STOP_B	DIST	NAME	SEQ	OWNER	AB_VOL	AB_BRDA	AB_XITA	AB_BRDB	AB_XITB	BA_VOL	BA_BRDA	BA_XITA	BA_BRDB	BA_XITB
256	8001	22395	20	12	0.00	0	2	0	0	1	*12	0	WMATA;SHAD	138	0	0	0	0	601	0	0	0	0
257	8002	9005	20	12	0.00	0	2	0	0	1	*12	0	WMATA;SHAD	0	0	0	0	0	0	0	0	0	0
258	8002	22351	20	12	0.00	0	2	0	0	1	*12	0	WMATA;SHAD	160	0	0	0	0	236	0	0	0	0
259	8002	22370	20	12	0.00	0	2	0	0	1	*12	0	WMATA;SHAD	436	0	0	0	0	586	0	0	0	0
260	8003	22344	20	12	0.00	0	2	0	0	1	*12	0	WMATA;SHAD	542	0	0	0	0	776	0	0	0	0
261	8003	22672	20	12	0.00	0	2	0	0	1	*12	0	WMATA;SHAD	545	0	0	0	0	248	0	0	0	0
262	8004	22332	20	12	0.00	0	2	0	0	1	*12	0	WMATA;SHAD	830	0	0	0	0	613	0	0	0	0
263	8004	22670	20	12	0.00	0	2	0	0	1	*12	0	WMATA;SHAD	199	0	0	0	0	34	0	0	0	0
264	8005	22327	20	12	0.00	0	2	0	0	1	*12	0	WMATA;GROS	99	0	0	0	0	1757	0	0	0	0

Figure 43 Excerpt from one of the transit link DBF files output from transit assignment (i4_WKMRAMlink.dbf) showing mode-12 links

Ref: "X:\modelRuns\fy12\Ver2.3.36\2007_pseu\i4_WKMRAMlink.dbf"

24.2 Transit assignment summary process

The purpose of the transit assignment *summary* process is to summarize the output from the transit assignment process. The process is run with the *transum.bat* batch file, which, like the *Transit_Assignment_Parallel.bat* batch file, is called from the “run model steps” batch file (see page A-16 of Appendix A). Whereas the transit assignment process is run in the scenario/output folder (e.g., 2016_Final), the transit assignment summary process is run in the **transum** folder (e.g., 2016_Final**transum**), which is a subfolder of the scenario/output folder. In the past, such as the Version 2.3.36 model, there were two transit assignment summary programs (LineVol and LineSum). LineVol was used to merge transit assignment output files into peak and off-peak files. Now, there is only one of these (LineSum, ver. 6.0.2),[143] since LineSum performs all the functionality needed, including the merging of output files.

An excerpt from the *transum.bat* batch file is shown in Figure 44 and the complete batch file can be found in Appendix B. When the model run is begun, the “transum” folder must exist under the scenario folder (e.g., 2017_Final\transum), **but the folder is completely empty**. The control files needed to run LineSum are stored in the “controls” folder. Although the station names file (station_names.dbf) used to be stored in the “controls” folder, this file is now generated by *Set_Factors.s* and is stored in the “inputs” folder (this change occurred in the Ver. 2.3.57a). The station names file includes Metrorail stations, commuter rail station, and other “named” nodes, such as the following:

Metrorail	**Commuter rail**	**Other named nodes**
8001 Shady Grove	9001 Union Station	45558 Bristol
8002 Rockville	9002 Silver Spring	44132 Broken Land Pkwy
8003 Twinbrook	9003 Kensington	22539 Burtonsville Crossi
8004 White Flint	9004 Garrett Park	26130 Capital Plaza
8005 Grosvenor	9005 Rockville	20811 Carter Barron
8006 Medical Center	9006 Washington Grove	49556 Charlotte Hall
8007 Bethesda	9007 Gaithersburg	27208 Clinton

Once the transit assignment summary process is finished, the folder will include both a copy of the control files that were used and the report files generated by LineSum.

The following control files, associated with LineSum, are stored in the “controls” folder and are called by the *transum.bat* batch file:

```
LineSum_Volume.ctl
lineSum_MR_access.ctl
lineSum_MR_line.ctl
```

These files are described below and the model user can always develop more control files to generate more reports.

---

[143] AECOM, *LineSum*, version 6.0.2 (Arlington, Virginia: AECOM, 2014).

At the beginning of the transum.bat batch file (line 8 in Figure 44), the change directory command is used to change the working directory to the "transum" folder. In line 11, a local copy of the LineSum control files is made in the transum folder. In line 14, we create a peak-period and off-peak period file containing the transit assignment. In line 18 of Figure 44, we generate a Metrorail station access report. This station access report does not include transfers from one Metrorail line to another, just the number of boardings at each station. Lastly, in line 22, we create line summaries for the Metrorail system.

Figure 44 An excerpt of *tranSum.bat* transit summary batch file

```
1   :: TranSum.bat
2   :: To be run from the root directory (e.g., E:\modelRuns\fy13\Ver2.3.46)
3
4
5   REM Change to the Transum folder, under the scenario-specific folder
6   REM Output report files will be stored in the Transum folder
7   REM The Transum folder starts out empty, since station_names.dbf is stored in Controls
8   CD %1\Transum
9
10  REM Copy the lineSum control files from the Controls folder to the Transum folder
11  copy ..\..\Controls\LineSum_*.ctl
12
13  REM Consolidate peak and off-peak volumes from transit assignment
14  ..\..\software\LineSum.exe  LineSum_Volume.ctl
15  if %ERRORLEVEL% == 1 goto error
16
17  REM Metrorail station access (does not include transfers)
18  ..\..\software\LineSum.exe  lineSum_MR_access.ctl
19  if %ERRORLEVEL% == 1 goto error
20
21  REM Metrorail line summaries
22  ..\..\software\LineSum.exe  lineSum_MR_line.ctl
23  if %ERRORLEVEL% == 1 goto error
24
25  (etc.)
```

Ref: M:\fy17\CGV2_3_66_Conformity2016CLRP_Xmittal\TranSum.bat

24.2.1 Consolidating transit assignment output and displaying results

As shown on page A-16 of Appendix A, the LineSum_Volume.ctl (Figure 45) control file is used to consolidate the transit assignment volume DBF files into two summary volume files, one for the peak period (PK_VOL.DBF, equal to the HBW transit volumes) and one for the off-peak period (OP_VOL.DBF, equal to the sum of the HBS, HBO, NHW, and NHO transit volume files).

Figure 45 Consolidating peak and off-peak transit assignment volumes (LineSum_Volume.ctl)

```
TITLE                               Merge the Transit Volumes

DEFAULT_FILE_FORMAT                 DBASE

PEAK_RIDERSHIP_FILE_1               ..\i4_DRABAMlink.dbf                   //DRIVE ACCESS
PEAK_RIDERSHIP_FILE_2               ..\i4_DRBMAMlink.dbf
PEAK_RIDERSHIP_FILE_3               ..\i4_DRCRAMlink.dbf
PEAK_RIDERSHIP_FILE_4               ..\i4_DRMRAMlink.dbf
PEAK_RIDERSHIP_FILE_5               ..\i4_KRABAMlink.dbf                   //KISS AND RIDE ACCESS
PEAK_RIDERSHIP_FILE_6               ..\i4_KRBMAMlink.dbf
PEAK_RIDERSHIP_FILE_7               ..\i4_KRMRAMlink.dbf
PEAK_RIDERSHIP_FILE_8               ..\i4_WKABAMlink.dbf                   //WALK ACCESS
PEAK_RIDERSHIP_FILE_9               ..\i4_WKBMAMlink.dbf
PEAK_RIDERSHIP_FILE_10              ..\i4_WKCRAMlink.dbf
PEAK_RIDERSHIP_FILE_11              ..\i4_WKMRAMlink.dbf

OFFPEAK_RIDERSHIP_FILE_1            ..\i4_DRABOPlink.dbf                   //DRIVE ACCESS
OFFPEAK_RIDERSHIP_FILE_2            ..\i4_DRBMOPlink.dbf
OFFPEAK_RIDERSHIP_FILE_3            ..\i4_DRCROPlink.dbf
OFFPEAK_RIDERSHIP_FILE_4            ..\i4_DRMROPlink.dbf
OFFPEAK_RIDERSHIP_FILE_5            ..\i4_KRABOPlink.dbf                   //KISS AND RIDE ACCESS
OFFPEAK_RIDERSHIP_FILE_6            ..\i4_KRBMOPlink.dbf
OFFPEAK_RIDERSHIP_FILE_7            ..\i4_KRMROPlink.dbf
OFFPEAK_RIDERSHIP_FILE_8            ..\i4_WKABOPlink.dbf                   //WALK ACCESS
OFFPEAK_RIDERSHIP_FILE_9            ..\i4_WKBMOPlink.dbf
OFFPEAK_RIDERSHIP_FILE_10           ..\i4_WKCROPlink.dbf
OFFPEAK_RIDERSHIP_FILE_11           ..\i4_WKMROPlink.dbf

NEW_PEAK_RIDERSHIP_FILE             PK_VOL.dbf
NEW_PEAK_RIDERSHIP_FORMAT           DBASE
NEW_OFFPEAK_RIDERSHIP_FILE          OP_VOL.dbf
NEW_OFFPEAK_RIDERSHIP_FORMAT        DBASE
```

The output from the LineSum_Volume.ctl process is pk_vol.dbf and op_vol.dbf. Either of these transit loaded-link files can be brought into Cube Base as the transit layer, as is shown in Figure 46 through Figure 50.

Figure 46 Using the pk_vol.dbf file in Cube Base as the transit layer: All transit routes turned on, but non-transit links (modes 11-16) turned off

Ref: "X:\modelRuns\fy12\Ver2.3.36\2007_pseu\zonehwy.net"

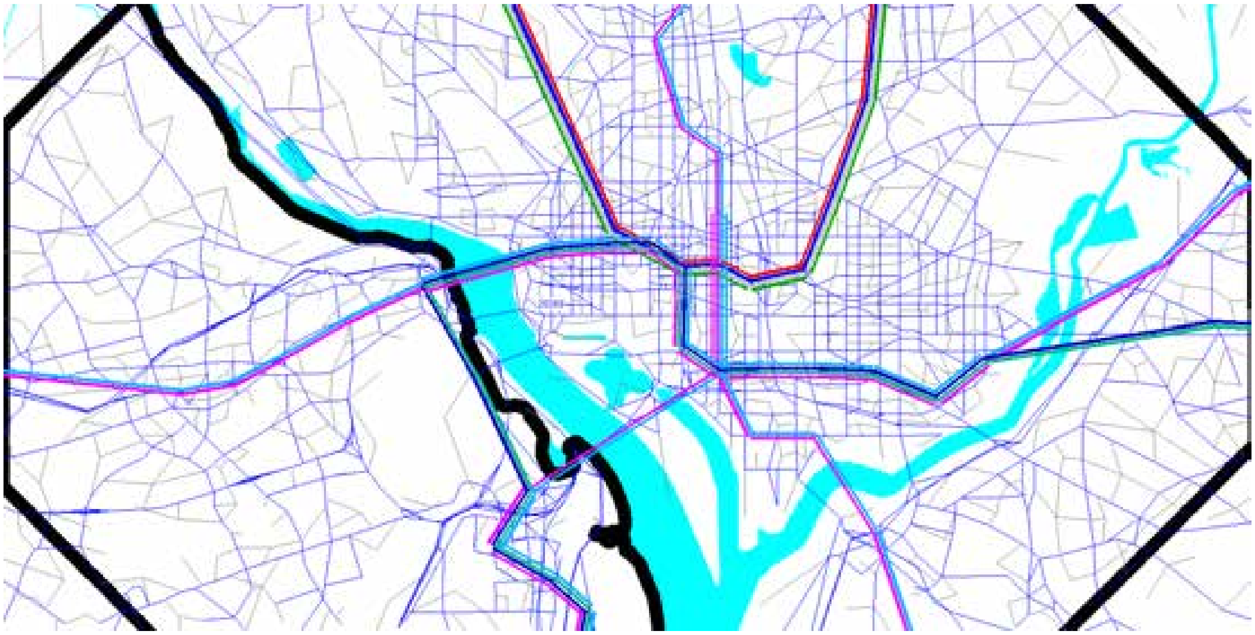


Figure 47 Using the pk_vol.dbf file in Cube Base as the transit layer: Only mode-3 (Metrorail) links turned on

Ref: "X:\modelRuns\fy12\Ver2.3.36\2007_pseu\zonehwy.net"

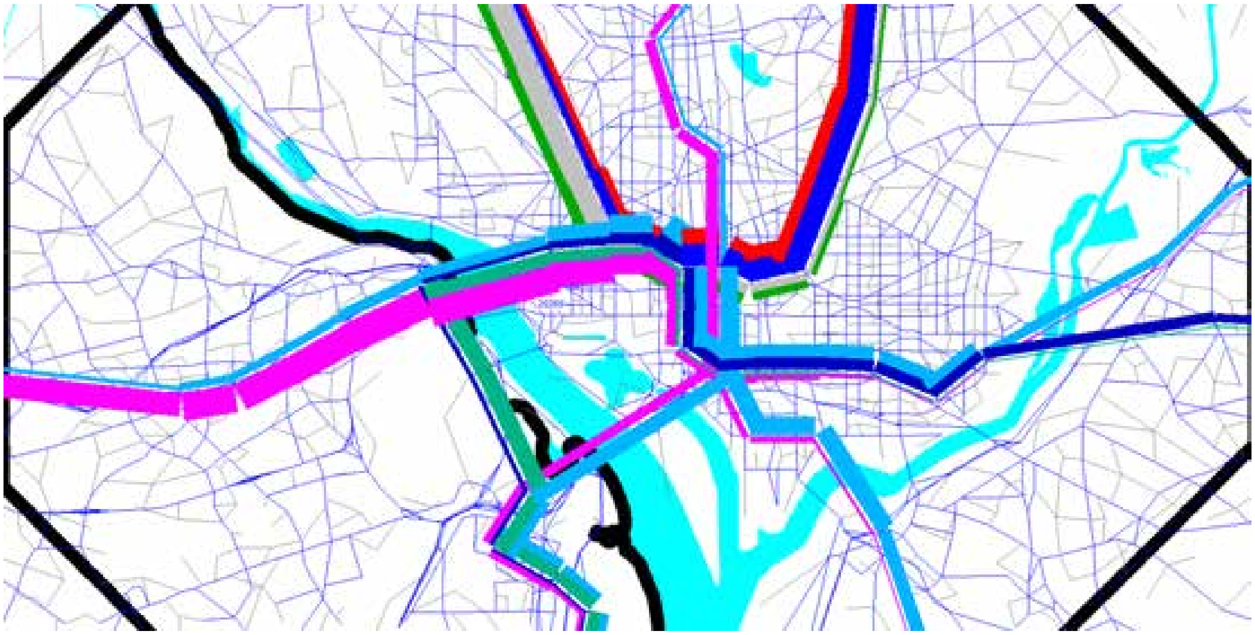


Figure 48 Using the pk_vol.dbf file in Cube Base as the transit layer: Only mode-3 (Metrorail) links turned on; using multi-bandwidth to represent transit loads (ab_vol): Arlington and DC

Ref: "X:\modelRuns\fy12\Ver2.3.36\2007_pseu\zonehwy.net"

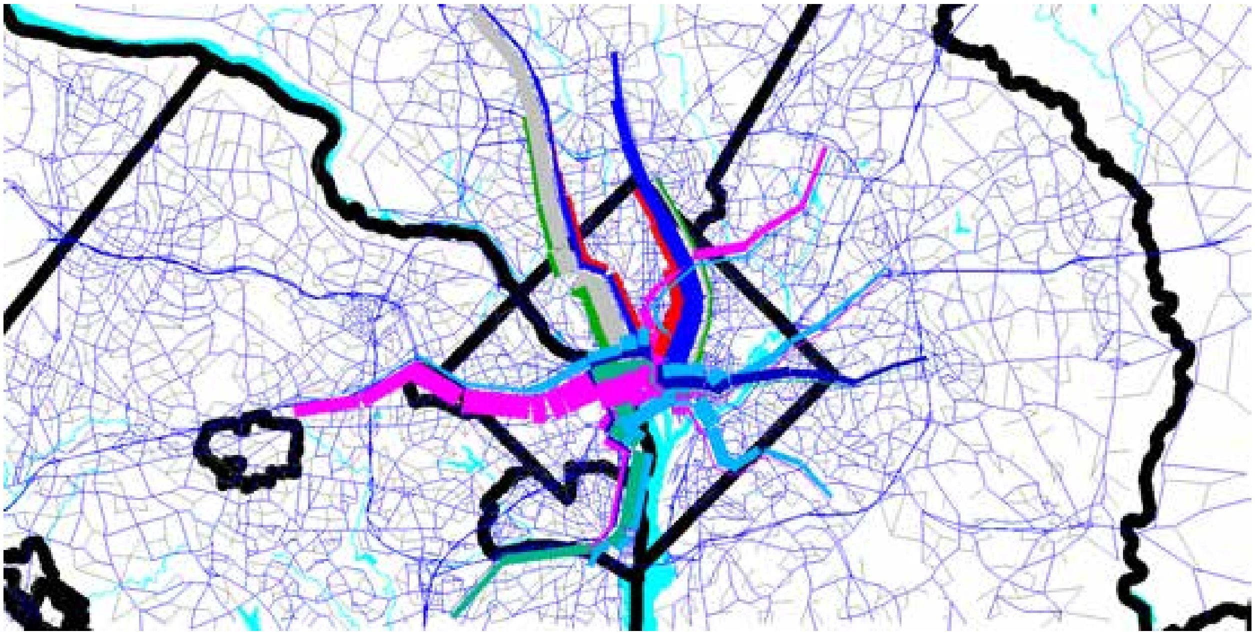
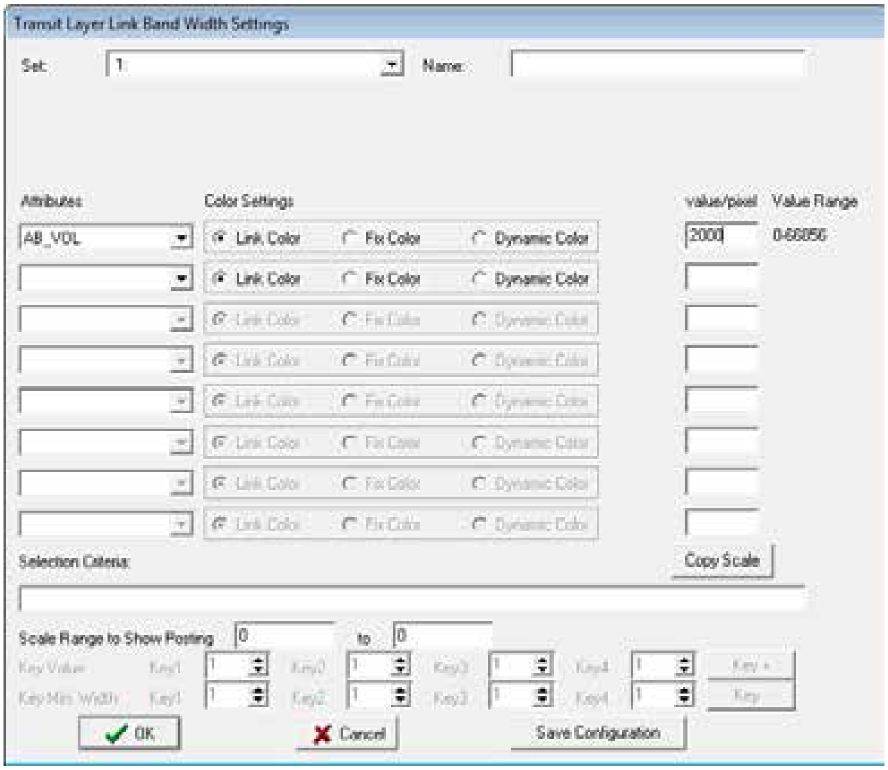


Figure 49 Using the pk_vol.dbf file in Cube Base as the transit layer: Only mode-3 (Metrorail) links turned on; using multi-bandwidth to represent transit loads (ab_vol): Metrorail system

Ref: "X:\modelRuns\fy12\Ver2.3.36\2007_pseu\zonehwy.net"



Transit Layer Link Band Width Settings

Set: 1

Name:

Attributes	Color Settings	value/pixel	Value Range
AB_VOL	● Link Color ○ Fix Color ○ Dynamic Color	2000	0-66056
	● Link Color ○ Fix Color ○ Dynamic Color		
	● Link Color ○ Fix Color ○ Dynamic Color		
	● Link Color ○ Fix Color ○ Dynamic Color		
	● Link Color ○ Fix Color ○ Dynamic Color		
	● Link Color ○ Fix Color ○ Dynamic Color		
	● Link Color ○ Fix Color ○ Dynamic Color		
	● Link Color ○ Fix Color ○ Dynamic Color		

Selection Citeria:

Scale Range to Show Posting 0 to 0

Key Value Key1 1 Key2 1 Key3 1 Key4 1

Key Min. Width Key1 1 Key2 1 Key3 1 Key4 1

Figure 50 Using the multi-bandwidth option in Cube Base to show transit volumes on the Metrorail system.

24.2.2 Generating transit assignment summaries using LineSum

The LineSum C++ program summarizes transit line volume data stored in a TRNBUILD loaded link DBF file. It can be used to create the following summaries:

- Boarding/alighting information
- Station access information
- Link-based summaries (i.e., between stations).
- Transit route/line summaries

An example of a control file used to generate an access report showing riders who arrive at and depart from Metrorail stations (via transit access links) can be seen in Figure 51. The station_names.dbf file is now stored in the "inputs" folder (not the "controls") folder.

Figure 51 Generating a Metrorail station access report (lineSum_MR_access.ctl)

```
## Access reports focus on riders who arrive or depart using transit access links
## i.e., the summary does not include transfers
TITLE                             Metrorail Station Access Summmary
DEFAULT_FILE_FORMAT               DBASE

PEAK_RIDERSHIP_FILE_1                                   PK_VOL.DBF
PEAK_RIDERSHIP_FORMAT_1                                 DBASE
OFFPEAK_RIDERSHIP_FILE_1                                OP_VOL.DBF
OFFPEAK_RIDERSHIP_FORMAT_1                              DBASE

STOP_NAME_FILE                    ..\inputs\station_names.dbf
STOP_NAME_FORMAT                  DBASE

ACCESS_REPORT_TITLE_1                                             All
ACCESS_REPORT_STOPS_1                                             8001..8100, 8119..8140, 8145..8148, 8150..8154,
8160..8166, 8169..8182
##ACCESS_REPORT_MODES_1                                           11,12,14,15,16
ACCESS_REPORT_MODES_1                                             ALL
##ACCESS_REPORT_DETAILS_1       MODE
NEW_ACCESS_REPORT_FILE_1                MR_access.txt
NEW_ACCESS_REPORT_FORMAT_1              TAB_DELIMITED
```

Similarly, an example of a control file used to generate a Metrorail line summary can be seen in Figure 52. Once again, the station_names.dbf file is now stored in the "inputs" folder (not the "controls") folder.

Figure 52 Generating a Metrorail line summary (lineSum_MR_line.ctl)

```
## Line reports summarize boardings, alightings, and ridership for one or more line
TITLE                             Metrorail Line Summmary
DEFAULT_FILE_FORMAT               DBASE

PEAK_RIDERSHIP_FILE_1                                   PK_VOL.DBF
PEAK_RIDERSHIP_FORMAT_1                                 DBASE
OFFPEAK_RIDERSHIP_FILE_1                                OP_VOL.DBF
OFFPEAK_RIDERSHIP_FORMAT_1                              DBASE

STOP_NAME_FILE                    ..\inputs\station_names.dbf
STOP_NAME_FORMAT                  DBASE

LINE_REPORT_TITLE_1                                                 All
LINE_REPORT_LINES_1           All
LINE_REPORT_MODES_1           3
```

```
NEW_TOTAL_RIDERSHIP_FILE_1    MR_line.txt
NEW_TOTAL_RIDERSHIP_FORMAT_1  TAB_DELIMITED
```

An example of the report generated by the lineSum_MR_**access**.ctl control file can be found in Figure 53. Similarly, an example of the report generated by the lineSum_MR_**line**.ctl control file can be found Figure 54.

More information about using LineSum can be found in its documentation:

- AECOM. (2013). LineSum, Quick Reference, Version 5.0.17. Arlington, Virginia: AECOM.
- AECOM. (2014). LineSum (Version 6.0.2). Arlington, Virginia: AECOM.

Figure 53 An excerpt from the report file generated by lineSum_MR_access.ctl

```
********************************************
|                                          |
|         LineSum - Version 6.0.2          |
|  Copyright 2014 by TRANSIMS Open-Source  |
|         Tue Sep 11 04:41:33 2018         |
|                                          |
********************************************

Control File = lineSum_MR_access.ctl
Report File  = lineSum_MR_access.prn (Create)

Metrorail Station Access Summmary

Default File Format = DBASE

LineSum Control Keys:

Peak Ridership File #1 = PK_VOL.DBF

Offpeak Ridership File #1 = OP_VOL.DBF


Stop Name File = ..\..\controls\station_names.dbf

Access Report Title = All
Access Report Stops = 8001..8100, 8119..8140, 8145..8148, 8150..8154, 8160..8166, 8169..8182
Access Report Modes = ALL
New Access Report File #1 = MR_access.txt
New Access Report Format #1 = TAB_DELIMITED


Number of Stop Names = 446  Metrorail Station Access Summmary
Tue Sep 11 04:41:34 2018  LineSum  page 2


Title: All
Modes: All

        ---- Peak ----  -- Offpeak ---  ---- Daily ---
Stop    Arrive  Depart  Arrive  Depart  Arrive  Depart

8001     34719    2676    2252     705   36971    3381  Shady Grove
8002     12771    2899    1209     865   13980    3764  Rockville
8003      5500    4230     947    1400    6447    5630  Twinbrook
8004      6462    7816    1273    2706    7735   10522  White Flint
8005      9806     301    2003     587   11809     888  Grosvenor
8006      4902    7237    1085    1584    5987    8821  Medical Center
```

```
     8007     15291   19297    4879    6070   20170   25367  Bethesda
     8008     10843    6735    3402    2916   14245    9651  Friendship Heights
     8009     10247    5849    2938    1708   13185    7557  Tenleytown
     8010      5501    3360    1946    1368    7447    4728  Van Ness-UDC
     8011      4685     889    1539     760    6224    1649  Cleveland Park
     8012      8082    2629    2660    1537   10742    4166  Woodley Park-Zoo
     8013     10939   30437    1946    6301   12885   36738  Dupont Circle
     8014      3399   35046    1389    3722    4788   38768  Farragut North
     8015       691   31251     295    4081     986   35332  Metro Center
     8016       490   20397     707    3286    1197   23683  Gallery Place
     8017       251   14986     212    1310     463   16296  Judiciary Square
     8018     29588   39035    5116    6321   34704   45356  Union Station
```

Figure 54 The report file generated by lineSum_MR_line.ctl

```
********************************************
|                                          |
|         LineSum - Version 6.0.2          |
|  Copyright 2012 by TRANSIMS Open-Source  |
|         Tue Sep 11 04:41:34 2018         |
|                                          |
********************************************

Control File = lineSum_MR_line.ctl
Report File  = lineSum_MR_line.prn (Create)

Metrorail Line Summmary

Default File Format = DBASE

LineSum Control Keys:

Peak Ridership File #1 = PK_VOL.DBF

Offpeak Ridership File #1 = OP_VOL.DBF


Stop Name File = ..\..\controls\station_names.dbf

Line Report Title = All
Line Report Lines = All
Line Report Modes = 3


Number of Stop Names = 267       Metrorail Line Summmary
Tue Sep 11 04:41:35 2018         LineSum  page 2


Title: All
Lines: All
Modes: 3

                           ---------------- A->B Direction (Read Down) --------------  --------------- B->A Direction (Read Up) -----------------  -------Total------
              Dist   Time  -------Peak-------  -----Off-Peak-----  -------Daily------  -------Peak-------  -----Off-Peak-----  -------Daily------  -------Daily------
Stop        (miles) (min)     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride

Franconia-    3.49   6.29  12346     0  12346   1380     0   1380  13726     0  13726      0  2446   2446      0   602    602      0  3048   3048  13726  3048  16774
Van Dorn S    3.86   5.08   8410   174  20584   1997    59   3318  10407   233  23902    466   831   2810     76   704   1231    542  1535   4041  10949  1768  27943
King Stree    0.68   2.07   4386  1666  48952   1075   847   7331   5461  2513  56283    549  2619  11717    267  1248   5521    816  3867  17238   6277  6380  73521
Braddock R    1.21   1.98   5789  1541  53201   1657  1113   7872   7446  2654  61073    707  2841  13853    658  2133   6996   1365  4974  20849   8811  7628  81922
Potomac Ya    1.82   2.98  10851  2311  61738   3073  1448   9498  13924  3759  71236   1306  3903  16445   2000  1930   6928   3306  5833  23373  17230  9592  94609
National A    0.49   2.65      0  1198  60540    371   173   9695    371  1371  70235      0  2675  19124     73   686   7540     73  3361  26664    444  4732  96899
Crystal Ci    0.76   2.07   5140  5462  60219   3087  1532  11249   8227  6994  71468    949 17358  35532   1047  5514  12007   1996 22872  47539  10223 29866 119007
Pentagon C    0.61   1.01   8973  5450  63740   2039   825  12463  11012  6275  76203   2029  5116  38617   1118  2343  13230   3147  7459  51847  14159 13734 128050
Pentagon      1.24   2.99   2336  5842  18109   2063  1785   8540   4399  7627  26649   2693  2568  11286   1634  1278   5934   4327  3846  17220   8726 11473  43869
Arlington     0.99   2.14    105     0  18213     75     0   8615    180     0  26828     36     0  11249     25     0   5910     61     0  17159    241     0  43987
Rosslyn       1.35   3.19   5710 13813  88316   1830  6291  14363   7540 20104 102679  11195 14723  47980   5065  4051  13410  16260 18774  61390  23800 38878 164069
Foggy Bott    0.57   2.14   2148 11054  79410   1394  2638  13119   3542 13692  92529    814 29872  77039    841  5620  18193   1655 35492  95232   5197 49184 187761
Farragut W    0.38   0.99   1229 13797  66840    466  1567  12014   1695 15364  78854    834 24187 100391    354  2825  20660   1188 27012 121051   2883 42376 199905
```

```
McPherson     0.46   1.11   4155 11702  59294   1362  2010  11367   5517 13712  70661   2426 36361 134327    964  4082  23773   3390 40443 158100   8907 54155 228761
Metro Cent    0.29   0.94  18835 36658  41472   3476  5778   9065  22311 42436  50537  66870 22588  90043  10239  5363  18896  77109 27951 108939  99420 70387 159476
Federal Tr    0.41   2.15      0  6810  34665     30   805   8289     30  7615  42954     70  1264  91236    104   284  19078    174  1548 110314    204  9163 153268
Smithsonia    0.59   2.34    389  8833  26224    191  1748   6731    580 10581  32955   1206  2399  92434    577   759  19261   1783  3158 111695   2363 13739 144650
L'Enfant P    0.33   1.99  12507 12401  26326   3579  3179   7132  16086 15580  33458  46959 21081  66557   7352  6982  18895  54311 28063  85452  70397 43643 118910
Federal Ce    0.57   1.96     53  9530  16851    173  1854   5453    226 11384  22304    990  1976  67546    984   722  18632   1974  2698  86178   2200 14082 108482
Capitol So    0.50   1.99     70  8924   8000    248  1551   4149    318 10475  12149    811  3214  69946    903   985  18713   1714  4199  88659   2032 14674 100808
Eastern Ma    0.63   2.02    160  2580   5578    368   928   3587    528  3508   9165   3809  2248  68386   1950   539  17301   5759  2787  85687   6287  6295  94852
Potomac Av    0.66   0.99    413  1101   4892    268   815   3041    681  1916   7933   9501   434  59320   3706   406  14006  13207   840  73326  13888  2756  81259
Stadium Ar    2.69   3.17    687   515   2528    299   779   1410    986  1294   3938   5186   921  32604   1710   415   8440   6896  1336  41044   7882  2630  44982
Benning Ro    1.42   2.90    266   746   2045    201   608   1004    467  1354   3049   5890   376  27091   2586   362   6215   8476   738  33306   8943  2092  36355
Capitol He    0.97   2.95    119   477   1687     62   429    639    181   906   2326   5397    97  21790   2818    95   3491   8215   192  25281   8396  1098  27607
Addison Ro    1.77   3.13    155   327   1515     44   121    560    199   448   2075   8360    54  13485   1234    28   2282   9594    82  15767   9793   530  17842
Morgan Blv    1.23   2.78    141   466   1189     40   142    459    181   608   1648   3707    45   9823    637    34   1678   4344    79  11501   4525   687  13149
Largo Town                        1189                 459                1648          9823                1678               11501               11501  1648
Greenbelt     2.44   2.88  15152     0  15152   1417     0   1417  16569     0  16569      0  1155   1155      0   225    225      0  1380   1380  16569  1380  17949
College Pa    1.94   3.02   5085   694  19543   1384   171   2630   6469   865  22173    210  3534   4476     54  1119   1289    264  4653   5765   6733  5518  27938
PG Plaza      1.24   3.14   5513   687  24364   1339   222   3749   6852   909  28113    481  2172   6163    178   487   1598    659  2659   7761   7511  3568  35874
West Hyatt    1.99   2.92   4343   140  28567   1998   245   5502   6341   385  34069    582   359   5943    251   302   1649    833   661   7592   7174  1046  41661
Fort Totte    1.62   2.89   6778 17364  17977   2895  3176   5221   9673 20540  23198   3378  3340   5902    920  1685   2413   4298  5025   8315  13971 25565  31513
Georgia Av    0.86   3.11   8768  3350  23396   2616  1117   6720  11384  4467  30116   2434  3916   7384    998  1168   2582   3432  5084   9966  14816  9551  40082
Columbia H    0.95   2.02  11346  1047  33692   2676   622   8772  14022  1669  42464   1029  2223   8580    495  1191   3280   1524  3414  11860  15546  5083  54324
U-Street-C    0.51   2.05   5194  2931  35959   2242   979  10038   7436  3910  45997    492  6235  14323    341  2402   5340    833  8637  19663   8269 12547  65660
Shaw-Howar    0.56   1.13   3186   685  38460   1462   380  11121   4648  1065  49581    734  2174  15764    333  1064   6070   1067  3238  21834   5715  4303  71415
Mt Vernon     0.49   1.66   2096  2600  37958   1203  1082  11242   3299  3682  49200    158 11171  26774    211  2561   8418    369 13732  35192   3668 17414  84392
Gallery Pl    0.36   1.92  37196 19641  55514   5690  5039  11892  42886 24680  67406  13001 45140  58913   2840  7040  12619  15841 52180  71532  58727 76860 138938
Archives      0.58   1.97   2411  3268  54655    156   656  11391   2567  3924  66046   4679 10749  64983     44  1454  14028   4723 12203  79011   7290 16127 145057
L'Enfant P    0.79   1.91  14484 21213  30763   2656  3917   6073  17140 25130  36836  10228 39128  66117   3302 11376  19284  13530 50504  85401  30670 75634 122237
Waterfront    0.59   1.80    816  5192  26386    657   911   5817   1473  6103  32203   4152  1394  63360   1867  1059  18477   6019  2453  81837   7492  8556 114040
Navy Yard     1.20   2.06    438 19198   7629    662  3025   3454   1100 22223  11083   6662  4978  61677   3773  1514  16217  10435  6492  77894  11535 28715  88977
Anacostia     1.38   2.98    369  5063   2934    470  1793   2128    839  6856   5062  14738  1087  48028   6810   466   9872  21548  1553  57900  22387  8409  62962
Congress H    0.97   1.78     85  1203   1815    113   642   1598    198  1845   3413   4877   372  43524   2138   195   7930   7015   567  51454   7213  2412  54867
Southern A    1.24   2.76    214   302   1725    112   484   1224    326   786   2949  14918    67  28674   3795   130   4266  18713   197  32940  19039   983  35889
Naylor Roa    1.48   2.34    184   619   1291     74   638    661    258  1257   1952   8961   119  19831   1317    67   3015  10278   186  22846  10536  1443  24798
Suitland      1.64   2.66     35   929    396     12   482    191     47  1411    587   4426    89  15495   1189    19   1844   5615   108  17339   5662  1519  17926
Branch Ave                         396                 191                 587         15495                1844               17339               17339   587
Vienna        2.39   3.69  21333     0  21333   1868     0   1868  23201     0  23201      0  1330   1330      0   596    596      0  1926   1926  23201  1926  25127
Dunn Lorin    2.49   3.99   6374   190  27519   1218    63   3023   7592   253  30542    113  1542   2757     57   762   1302    170  2304   4059   7762  2557  34601
West Falls    2.09   2.93   3279    54  30744    633    27   3629   3912    81  34373    122   342   2977     48   307   1562    170   649   4539   4082   730  38912
East Falls    2.51   3.96  12817  3272  81908   2585   835  10985  15402  4107  92893    632  1582  22154    434  1213   9219   1066  2795  31373  16468  6902 124266
```

```
Metrorail Line Summmary
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                           ---------------- A->B Direction (Read Down) --------------  -------------- B->A Direction (Read Up) ------------------  -------Total------
              Dist   Time  -------Peak-------  -----Off-Peak-----  -------Daily------  -------Peak-------  -----Off-Peak-----  -------Daily------  -------Daily------
Stop        (miles) (min)     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride

Ballston      0.49   1.67  14638  6083  90465   4959  1756  14188  19597  7839 104653   2657 11870  31363   1544  4254  11933   4201 16124  43296  23798 23963 147949
Virginia S    0.49   2.01   3318  2807  90974   1323  1085  14426   4641  3892 105400   1066  4023  34322    558  1613  12993   1624  5636  47315   6265  9528 152715
Clarendon     0.67   2.52   5780  2744  94010   1787  1484  14727   7567  4228 108737   1673  4925  37567   1361  1905  13536   3034  6830  51103  10601 11058 159840
Court Hous    0.91   1.69   6302  3940  96369   2540  1633  15636   8842  5573 112005   1553  7596  43613   1369  2516  14680   2922 10112  58293  11764 15685 170298
Rosslyn                          18164                5429               23593         10410                6171               16581               16581 23593
Stadium Ar    2.19   3.99    799     0   3333    231     0   1380   1030     0   4713      0   668  23120      0   282   4556      0   950  27676   1030   950  32389
Minnesota     0.91   1.95    360  1094   2603    208   347   1240    568  1441   3843   5891   425  17653   1753   173   2976   7644   598  20629   8212  2039  24472
Deanwood      1.15   1.90    271   247   2626     95   247   1087    366   494   3713   3372    67  14348   1104    71   1942   4476   138  16290   4842   632  20003
Cheverly      1.89   2.99    106   421   2312     19   108   1000    125   529   3312   1597    94  12848    332    16   1627   1929   110  14475   2054   639  17787
Landover      1.36   2.69    240   278   2276     30   195    836    270   473   3112   4593   101   8353    433    20   1214   5026   121   9567   5296   594  12679
New Carrol                        2276                 836                3112          8353                1214                9567                9567  3112
Shady Grov    2.61   4.06  34720     0  34720   2262     0   2262  36982     0  36982      0  2677   2677      0   705    705      0  3382   3382  36982  3382  40364
Rockville     2.13   3.29  12479   673  46524   1106   159   3207  13585   832  49731    290  2227   4615    101   704   1306    391  2931   5921  13976  3763  55652
Twinbrook     1.09   3.08   4880  1291  50114    699   353   3555   5579  1644  53669    618  2941   6936    250  1047   2102    868  3988   9038   6447  5632  62707
White Flin    1.35   2.03   5580  2334  53359    842   647   3750   6422  2981  57109    884  5480  11535    433  2060   3728   1317  7540  15263   7739 10521  72372
Grosvenor     2.19   3.05   9180    76  62465   1824   108   5467  11004   184  67932    629   226  11131    182   478   4024    811   704  15155  11815   888  83087
Medical Ce    1.02   2.01   4610  2098  64972    835   398   5905   5445  2496  70877    290  5136  15978    246  1183   4962    536  6319  20940   5981  8815  91817
Bethesda      1.70   3.08  11451  6438  69987   3479  2155   7227  14930  8593  77214   3841 12859  24995   1405  3914   7471   5246 16773  32466  20176 25366 109680
Friendship    0.91   2.41   8133  2004  76118   1801  1157   7870   9934  3161  83988   2712  4731  27016   1605  1754   7623   4317  6485  34639  14251  9646 118627
Tenleytown    1.09   2.03   7407  1674  81849   1782   441   9213   9189  2115  91062   2834  4174  28355   1157  1267   7735   3991  5441  36090  13180  7556 127152
Van Ness-U    0.55   1.82   4602   972  85482   1311   354  10169   5913  1326  95651    906  2388  29840    638  1015   8112   1544  3403  37952   7457  4729 133603
Cleveland     0.80   2.33   3547   213  88814   1083   191  11061   4630   404  99875   1136   676  29376    463   569   8219   1599  1245  37595   6229  1649 137470
Woodley Pa    1.15   1.99   6949   679  95085   2053   407  12706   9002  1086 107791   1132  1947  30197    611  1125   8735   1743  3072  38932  10745  4158 146723
Dupont Cir    0.56   2.28   9505 11510  93080   1494  2224  11977  10999 13734 105057   1435 18923  47687    454  4078  12359   1889 23001  60046  12888 36735 165103
Farragut N    0.79   2.22   1728 18506  76303    841  1307  11509   2569 19813  87812   1670 16539  62557    548  2414  14227   2218 18953  76784   4787 38766 164596
Metro Cent    0.33   1.18  30702 33439  73564   6140  4777  12873  36842 38216  86437  13349 67635 116842   3055 10775  21946  16404 78410 138788  53246116626 225225
Gallery Pl    0.33   0.92  26852 30441  69977   4602  4202  13274  31454 34643  83251  27957 29690 118577   5986  5415  21372  33943 35105 139949  65397 69748 223200
Judiciary     0.67   2.14     47 11446  58581     57   890  12438    104 12336  71019    204  3543 121917    155   416  21635    359  3959 143552    463 16295 214571
Union Stat    0.73   1.06   4865 24861  38582   1681  3704  10419   6546 28565  49001  24726 14175 111367   3434  2621  20821  28160 16796 132188  34706 45361 181189
New York A    0.96   1.86    685 24610  14655    797  6236   4979   1482 30846  19634   7632 11225 114955   4908  2917  18829  12540 14142 133784  14022 44988 153418
Rhode Isla    0.93   2.23   1569  3640  12582   1234  1672   4542   2803  5312  17124  15376  1857 101437   6658   772  12943  22034  2629 114380  24837  7941 131504
Brookland-    1.30   2.98    459  2036  11004    535   932   4150    994  2968  15154   3115  1448  99768   1496   594  12042   4611  2042 111810   5605  5010 126964
Fort Totte    1.89   3.10   3703  3725  10978   1643  1742   4049   5346  5467  15027  27293  5054  77530   5761  1158   7437  33054  6212  84967  38400 11679  99994
Takoma        1.47   3.22    757  2363   9373    445   888   3607   1202  3251  12980   6122   829  72237   1753   342   6025   7875  1171  78262   9077  4422  91242
Silver Spr    1.75   3.25    658  7872   2161    425  2720   1309   1083 10592   3470  41358  2970  33850   4840   757   1941  46198  3727  35791  47281 14319  39261
Forest Gle    1.58   4.07     63   897   1327     26   457    874     89  1354   2201   5556   163  28456    472    48   1519   6028   211  29975   6117  1565  32176
Wheaton       1.75   3.31     25  1077    273     20   721    174     45  1798    447  14672   116  13902    547    49   1018  15219   165  14920  15264  1963  15367
Glenmont                           273                 174                 447         13902                1018               14920               14920   447
Route 772/    2.08   3.53  13861     0  13861    515     0    515  14376     0  14376      0   397    397      0    94     94      0   491    491  14376   491  14867
VA 606/Wes    3.15   4.22   1055   124  14792     76    13    578   1131   137  15370    133   234    501      9    30    115    142   264    616   1273   401  15986
Dulles Air    1.83   2.88      0    52  14741    112    10    681    112    62  15422      0   250    749      7    87    194      7   337    943    119   399  16365
Innovation    1.84   4.18   5170   216  19695    843    38   1486   6013   254  21181    152   863   1458     30   535    699    182  1398   2157   6195  1652  23338
Herndon       1.15   1.85   8285  1092  26886   1507   247   2745   9792  1339  29631    315  2808   3950    151  1345   1895    466  4153   5845  10258  5492  35476
Reston Tow    1.27   3.76   2568  2091  27365   1213   906   3051   3781  2997  30416    725  3340   6568    686  1572   2781   1411  4912   9349   5192  7909  39765
Wiehle/Res    5.83   7.70   7272   888  33750   1186   718   3521   8458  1606  37271   1238  1586   6915   1007   832   2608   2245  2418   9523  10703  4024  46794
Spring HIl    0.46   1.03   3854  1231  36375   2077   523   5074   5931  1754  41449    528  4300  10687    504  2676   4779   1032  6976  15466   6963  8730  56915
Greensboro    0.69   1.56   3802  1544  38632   1274   434   5913   5076  1978  44545    798  4174  14061    399  2040   6421   1197  6214  20482   6273  8192  65027
Tysons Cor    1.19   2.79   3238  3237  38632   1801  1343   6373   5039  4580  45005   1361  7001  19703   1310  2679   7791   2671  9680  27494   7710 14260  72499
McLean Tys    3.90   6.10   6484  2512  42602   1967  2029   6310   8451  4541  48912   2132  6084  23654   2176  2515   8130   4308  8599  31784  12759 13140  80696
East Falls                         984                 706                1690          5429                1250                6679                6679  1690
```

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           L'Enfant P    2.35   5.15  18655     0  35818   5988     0  10048  24643     0  45866      0 39343  67109      0  2883   5702      0 42226  72811  24643 42226 118677
           Pentagon                          8612                3110               11722         24983                1501               26484               26484 11722
           King Stree    0.64   1.89   1624     0   8459    573     0   3882   2197     0  12341      0  2425  28076      0   557   4341      0  2982  32417   2197  2982  44758
           Eisenhower    0.55   1.08    119  6339   2238    124  2682   1323    243  9021   3561   4196  1355  25234   1363   783   3761   5559  2138  28995   5802 11159  32556
           Huntington                        2238                1323                3561         25234                3761               28995               28995  3561

           Total       130.90 261.70       575826              136451              712277              633113              162008              795121             1507398

Metrorail Line Summmary
           Tue Sep 11 04:41:35 2018  LineSum  page 4


                                      ---------------- A->B Direction (Read Down) --------------  --------------- B->A Direction (Read Up) -----------------  -------Total------
                         Dist   Time  -------Peak-------  -----Off-Peak-----  -------Daily------  -------Peak-------  -----Off-Peak-----  -------Daily------  -------Daily------
           Stop       (miles) (min)     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride     On   Off   Ride


           Max           5.83   7.70  37196 36658  96369   6140  6291  15636  42886 42436 112005  66870 67635 134327  10239 11376  23773  77109 78410 158100  99420116626 228761

           Passenger Miles                3932608              612906             4545514             3305303              732957             4038260             8583774
           Passenger Hours                 141005               23187              164192              129617               28892              158509              322701
           Average Trip Length (miles)        6.8                 4.5                11.3                 5.2                 4.5                 9.7                21.1
           Average Trip Length (minutes)     14.7                10.2                24.9                12.3                10.7                23.0                47.9

           Tue Sep 11 04:41:35 2018 -- Process Complete with 9 Warnings (0:00:01)
```

APPENDIX C:

MWCOG Validation Memos

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Carole Delion, Lisa Shemer, Subrat Mahapatra, MD SHA, Kari Snyder, MDOT
FROM: Dusan Vuksan, Feng Xie, Yu Gao, TPB Staff
SUBJECT: Model Validation for the Traffic Relief Plan
DATE: February 23, 2018
CC: Rich Roisman, Tim Canan, Ron Milone, Anant Choudhary, TPB Staff

This memorandum documents the 2016 Model Validation efforts related to the Traffic Relief Plan. It provides draft 2016 Model Validation results and a list of regional model output files that are being transmitted at this time.

PROJECT BACKGROUND

The Maryland State Highway Administration (SHA) has requested TPB staff assistance in preparing travel demand forecasts for different future alternatives and strategies for Maryland's Traffic Relief Plan. Although the project assumptions are still evolving, the project aims to assess the impacts of addition of dynamically priced lanes on Capital Beltway (I-495), I-270, and MD-295. It is being led by SHA with consulting support from Gannett Fleming. TPB staff work is being funded by the Maryland portion of the state Technical Assistance Program within the Unified Planning Work Program (UPWP).

VALIDATION TRANSMITTAL

Per standard TPB staff modeling practices, prior to executing future year alternatives, travel demand model output needs to be validated to existing conditions in the study area. TPB staff has executed a model validation run and prepared draft summaries, attached as an appendix to this transmittal memorandum. The summaries compare 2016 model estimates to the 2015 observed data. The appendix also includes the maps of study area and screenlines (Maps 1 and 2). TPB staff is transmitting the following model output files based on the regional model output:

- I4_assign_output.net (Final Loaded Network)
- i4_AM.VTT (Origin / Destination AM vehicle trip table)
- i4_PM.VTT (Origin / Destination PM vehicle trip table)
- i4_MD.VTT (Origin / Destination mid-day vehicle trip table)
- i4_NT.VTT (Origin / Destination night-time vehicle trip table)

The files can be accessed using the following ftp link:

ftp://dtpcog:cog.dtp@ftp.mwcog.org/MD_SHA_TRP_Study_2016_Val_Model_Files.zip

The Traffic Relief Plan Study inputs were based on Round 9.0 Cooperative Forecasts and the 2016 “Off-Cycle” Constrained Long Range Plan (adopted in October 2017). Highway network refinements were made to the official networks to more accurately reflect the study area transportation networks. The refinements include:

- Review and revisions of the number of lanes on I-495, I-270 and MD-295
- Review and revisions of coding of interchanges with access to/from the above freeways
- Additional refinements in the Fort Meade area (existing NSA interchange added)
- Decrease in highway capacity on MD-295 (degraded from freeway to expressway)

Given the project schedule-related time constraints, the refinements do not include:

- Revisions in external trips mainly impacting MD-295 and I-270 (discussed at one point)
- Zone splits and centroid connector revisions (with the exception of the Fort Meade area)
- Detailed review and revisions of coding of intersecting facilities

Version 2.3.70 travel demand model is the official TPB “production model”. Although this model was used as the starting point “base” model, it was subsequently revised to be able to better represent dynamically-priced lanes that do not provide preferential treatment to the high occupancy vehicles (which may be assumed in a number of build alternatives for the project). Essentially, to reflect this policy change, TPB staff removed what is known as the “HOV Skim Replacement” process, with the revised model no longer requiring the “base-run” modeling step for each analysis year. At the same time, the revised model still provides preferential treatment to the carpools on HOT lane facilities in Virginia, as HOV users of Virginia HOT lanes are able to access them free of charge. The resulting model used in preparation of these estimates will be referred to as the Version 2.3.71 travel demand model. Depending on the final build alternatives assumptions, this model may need to be refined further.

DRAFT RESULTS

Model results and summaries are included in the appendix. It is important to note that the selected Average Weekday Daily Traffic (AWDT) counts / observed data represent the 2015 conditions, while model output represents the 2016 conditions. At the time the study commenced, the 2015 counts were readily available in a format that could easily be used (and 2016 counts were not). Also, in recent history, individual facility counts tend to be fairly stable from year-to-year. SHA staff is welcome to review and update the observed counts in the attached tables.

As it is very challenging to validate a model at the link level, the TRP validation effort focused on the screenlines that were selected in consultation with SHA. Tables 1 and 2 show differences between estimated and observed volumes at the screenline level (please refer to Map 2). All of the estimated screenline volumes are within ±20% of the observed counts, with the exception of Screenline I-270-2 (at 33%). In addition, some of the estimated volumes for the Capital Beltway screenlines are close to the 20% margin (e.g., Screenline I-495-2), but these regional model findings are in line with the model validation for the Capital Beltway PEL Study conducted in 2016 and 2017[1].

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[1] Dusan Vuksan and Yu Gao, “Model Validation for Capital Beltway Planning Study”, TPB Technical Memorandum, August 23, 2016.

As expected, there is more variance in model output at the link level, but most link-level model estimates for I-270, I-495 and MD-295 are within ±25% of the observed counts (Tables 3a, 3b and 3c).

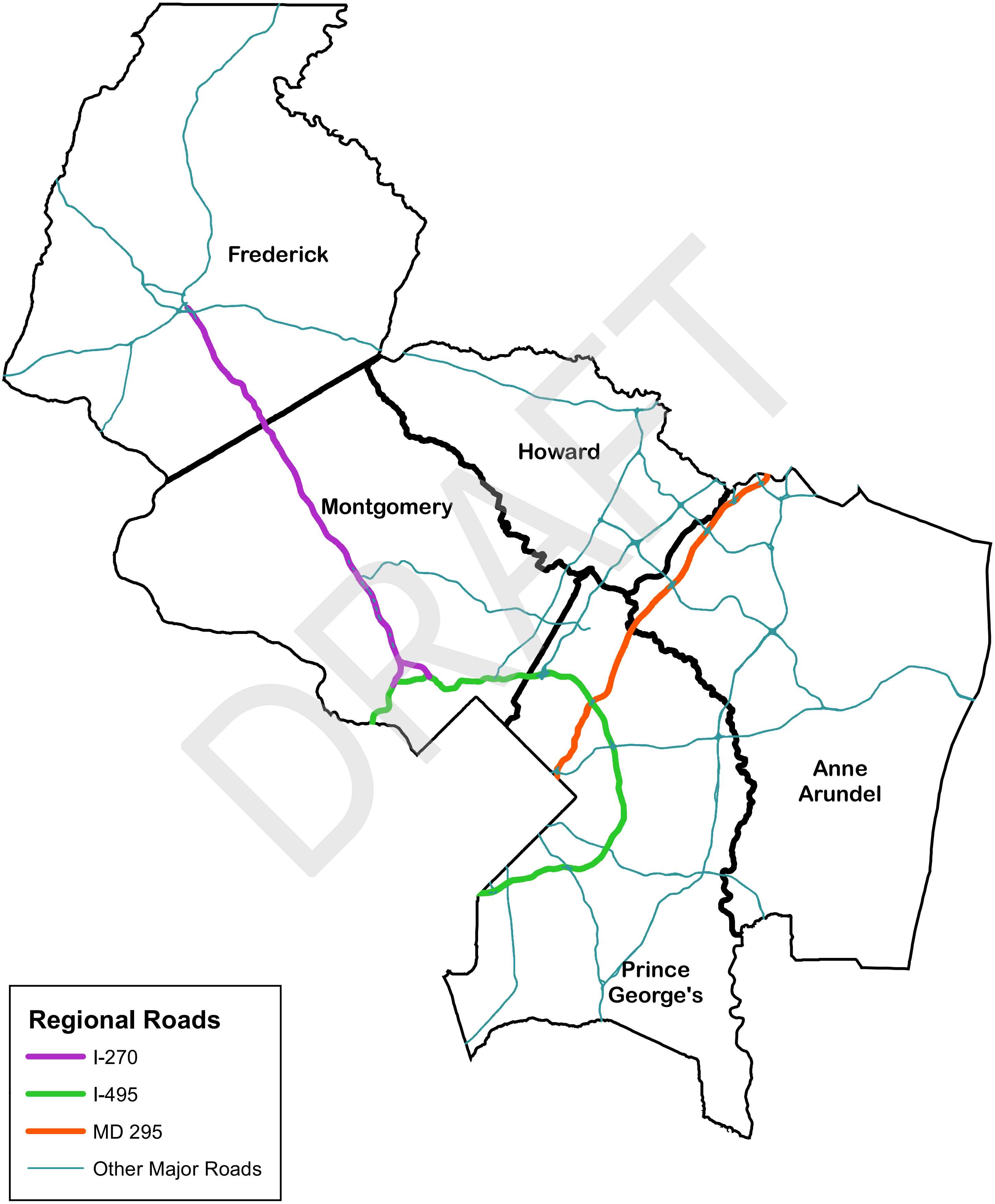
It is anticipated that any discrepancies between the estimated and observed data will be addressed through post-processing by SHA.

NEXT STEPS

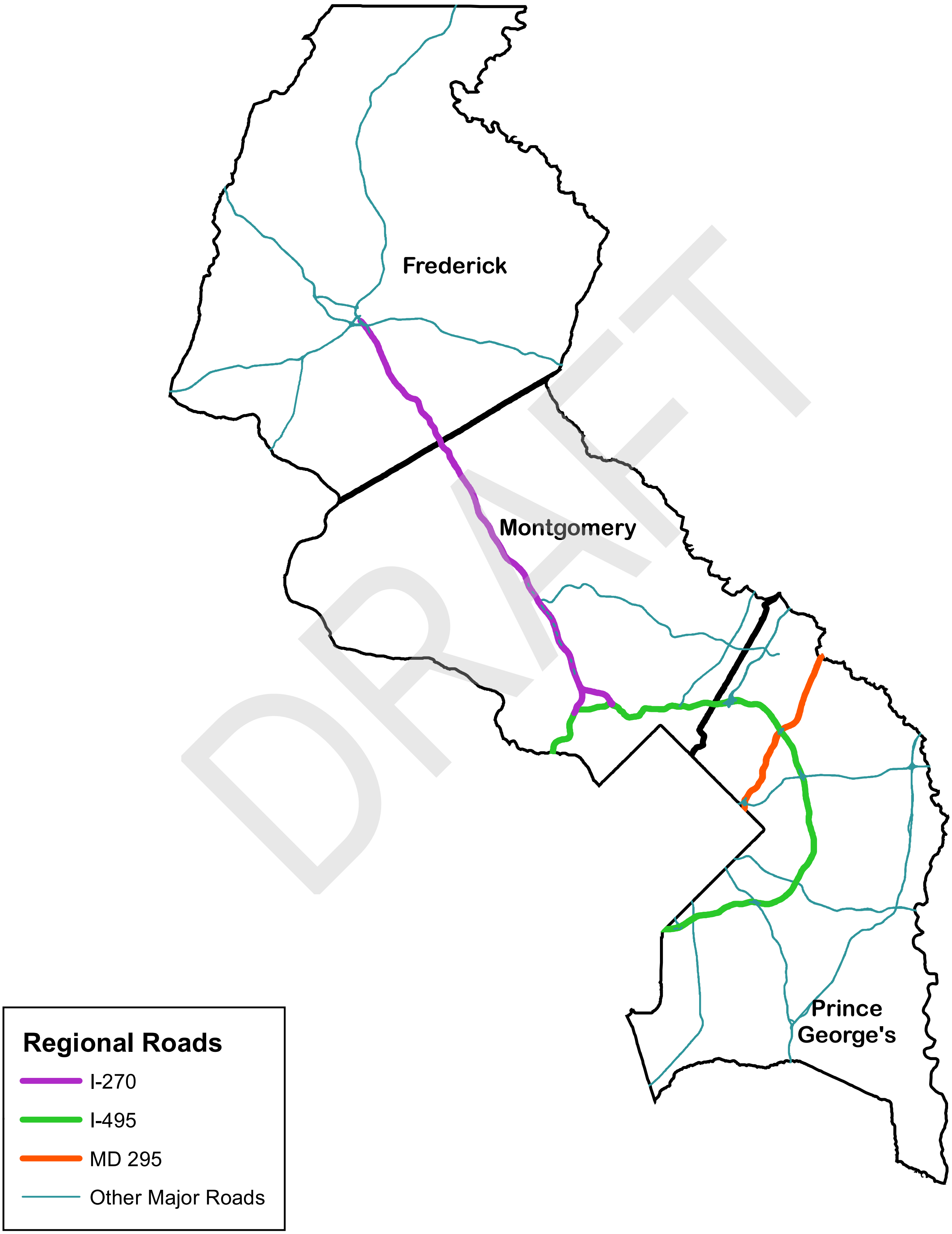
TPB staff looks forward to receiving feedback from SHA staff. If current model validation output is acceptable to SHA for the purposes of post-processing, TPB staff will move forward and execute the 2040 No Build.

APPENDIX

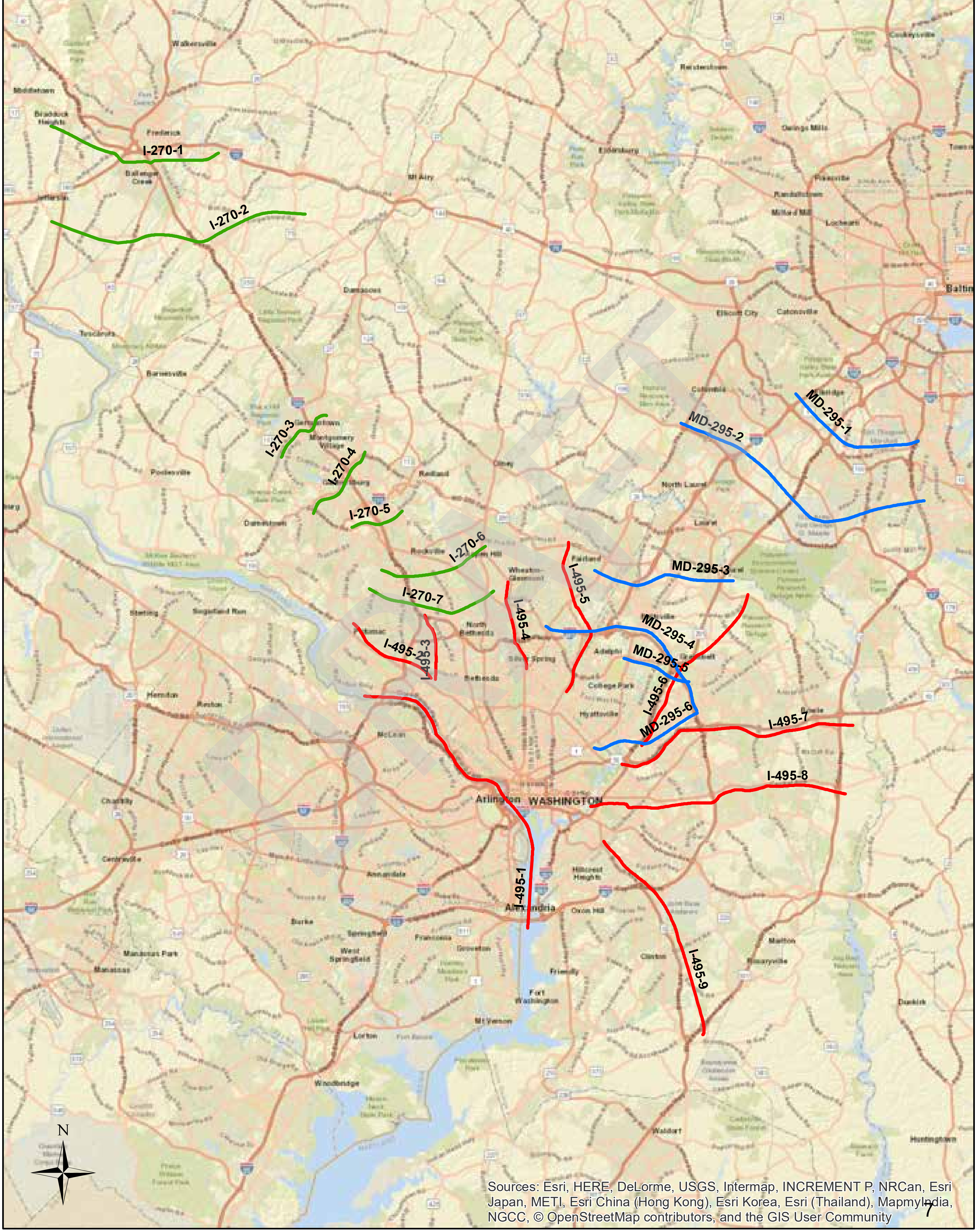
Map 1a. Maryland Traffic Relief Plan Study Area



Map 1b. Maryland Traffic Relief Plan Focused Study Area



Map 2. Maryland Traffic Relief Plan Study: Screenlines for I-270, I-495 and MD 295



Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

Table 1. Observed versus Simulated AAWDT Volumes* by Screenline; 2016 Validation

Screenline ID	Location	2015 Obs. Vol	2016 Sim. Vol	Difference	% Difference
I-270-1	South of I-70	288,116	307,940	19,824	7%
I-270-2	North of Fingerboard Rd	138,134	184,326	46,192	33%
I-270-3	South of Germantown Rd	231,104	249,901	18,797	8%
I-270-4	South of Quince Orchard Rd	363,634	359,373	-4,261	-1%
I-270-5	South of I-370	338,752	342,027	3,275	1%
I-270-6	North of Montrose Rd	436,266	473,757	37,491	9%
I-270-7	North of the Spurs	425,466	475,267	49,801	12%
I-495-1	Potomac River	916,448	935,888	19,440	2%
I-495-2	North of River Rd	302,322	357,450	55,128	18%
I-495-3	Between the Spurs	294,286	319,958	25,672	9%
I-495-4	West of Georgia Ave	421,760	473,152	51,392	12%
I-495-5	East of New Hampshire Ave	485,514	550,779	65,265	13%
I-495-6	East of Baltimore Washington Pkwy	393,800	358,883	-34,917	-9%
I-495-7	South of US 50	612,422	546,973	-65,449	-11%
I-495-8	South of Central Ave	496,968	436,251	-60,717	-12%
I-495-9	East of Branch Ave	362,926	298,519	-64,407	-18%
MD-295-1	North of Dorsey Rd	507,576	567,461	59,885	12%
MD-295-2	North of Patuxent Pkwy	622,442	738,213	115,771	19%
MD-295-3	South of ICC	466,246	530,330	64,084	14%
MD-295-4	North of Capital Beltway	695,960	742,843	46,883	7%
MD-295-5	South of University Blvd	392,356	367,867	-24,489	-6%
MD-295-6	North of US 50	442,280	423,291	-18,989	-4%

Note: * Links with no count are excluded from screenline totals.

Table 2a. Observed versus Simulated AAWDT Volumes by Facility for I-270 Screenlines; 2016 Validation

Screenline I-270-1

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Jefferson Blvd	1,520	924	-596	-39%
2	Old Swimming Pool Rd	N/A	928	N/A	N/A
3	Jefferson Pike	3,840	3,284	-556	-14%
4	US-15	62,870	91,962	29,092	46%
5	Balenger Creek Pike	13,534	9,727	-3,807	-28%
6	New Design Rd	19,390	19,136	-254	-1%
7	I-270	117,990	140,948	22,958	19%
8	Buckeystown Pike	27,370	21,490	-5,880	-21%
9	Urbana Pike	21,602	12,712	-8,890	-41%
10	Reichs Ford Rd	3,780	3,119	-661	-17%
11	Old National Pike	16,220	4,638	-11,582	-71%
	Subtotal*	288,116	307,940	19,824	7%

Screenline I-270-2

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Catoctin Mountain Hwy	21,180	29,767	8,587	41%
2	Ballenger Creek Pike	N/A	3,991	N/A	N/A
3	New Design Rd	N/A	2,970	N/A	N/A
4	Buckeystown Pike	6,850	10,242	3,392	50%
5	Park Mills Rd	N/A	2,708	N/A	N/A
6	I-270	90,110	117,287	27,177	30%
7	Urbana Pike	13,070	9,444	-3,626	-28%
8	Sugarloaf Pkwy	N/A	702	N/A	N/A
9	Ijamsville Rd	N/A	8,259	N/A	N/A
10	Ed McClain Rd	N/A	4,222	N/A	N/A
11	Green Valley Rd	6,924	17,586	10,662	154%
	Subtotal*	138,134	184,326	46,192	33%

Screenline I-270-3

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Clopper Rd	24,232	26,008	1,776	7%
2	Wisteria Dr	13,272	394	-12,878	-97%
3	Middlebrook Rd	24,540	17,162	-7,378	-30%
4	I-270	136,930	158,538	21,608	16%
5	Frederick Rd	32,130	47,799	15,669	49%
	Subtotal*	231,104	249,901	18,797	8%

Screenline I-270-4

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Darnestown Rd	27,952	33,296	5,344	19%
2	Great Seneca Hwy	42,620	31,364	-11,256	-26%
3	West Diamond Ave	50,492	35,977	-14,515	-29%
4	I-270	183,660	210,107	26,447	14%
5	North Frederick Ave	36,120	32,181	-3,939	-11%
6	Lost Knife Rd	N/A	3,791	N/A	N/A
7	Midcounty Hwy	22,790	16,448	-6,342	-28%
	Subtotal*	363,634	359,373	-4,261	-1%

Screenline I-270-5

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Great Seneca Hwy	29,372	26,107	-3,265	-11%
2	Omega Rd	N/A	6,779	N/A	N/A
3	Shady Grove Rd	39,630	34,449	-5,181	-13%
4	I-270	224,250	247,714	23,464	10%
5	Piccard Dr	N/A	7,442	N/A	N/A
6	Gaither Rd	N/A	6,646	N/A	N/A
7	Grand Champion Dr	N/A	741	N/A	N/A
8	Frederick Rd	45,500	33,757	-11,743	-26%
	Subtotal*	338,752	342,027	3,275	1%

Screenline I-270-6

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Falls Rd	20,684	18,481	-2,203	-11%
2	Seven Locks Rd	N/A	28,829	N/A	N/A
3	I-270	263,740	291,427	27,687	10%
4	Tower Oaks Blvd	11,272	11,772	500	4%
5	Rockville Pike	49,580	42,255	-7,325	-15%
6	Twinbrook Pkwy	N/A	24,633	N/A	N/A
7	Veirs Mill Rd	44,800	48,481	3,681	8%
8	Bauer Dr	N/A	3,574	N/A	N/A
9	Georgia Ave	46,190	61,341	15,151	33%
	Subtotal*	436,266	473,757	37,491	9%

Screenline I-270-7

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Falls Rd	21,074	23,256	2,182	10%
2	Seven Locks Rd	N/A	20,802	N/A	N/A
3	I-270	268,380	293,792	25,412	9%
4	Old Georgetown Rd	N/A	38,956	N/A	N/A
5	Rockville Pike	54,870	50,980	-3,890	-7%
6	Connecticut Ave	40,802	57,626	16,824	41%
7	Veirs Mill Rd	40,340	49,613	9,273	23%
	Subtotal*	425,466	475,267	49,801	12%

Table 2b. Observed versus Simulated AAWDT Volumes by Facility for I-495 Screenlines; 2016 Validation

Screenline I-495-1

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	American Legion Bridge	231,716	282,575	50,859	22%
2	Chain Bridge	31,874	35,831	3,957	12%
3	Key Bridge	41,448	54,124	12,676	31%
4	Roosevelt Bridge	93,813	99,980	6,167	7%
5	Memorial Bridge	57,116	58,490	1,374	2%
6	14th Street Bridge	246,189	182,444	-63,745	-26%
7	Woodrow Wilson Bridge	214,292	222,444	8,152	4%
	Subtotal*	916,448	935,888	19,440	2%

Screenline I-495-2

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Falls Rd	21,094	16,675	-4,419	-21%
2	Bradley Blvd	7,992	10,447	2,455	31%
3	Seven Locks Rd	N/A	14,364	N/A	N/A
4	Capital Beltway	262,112	317,153	55,041	21%
5	Burdette Rd	N/A	6,957	N/A	N/A
6	Wilson La	11,124	13,175	2,051	18%
	Subtotal*	302,322	357,450	55,128	18%

Screenline I-495-3

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	I-270 East Spur	119,200	126,047	6,847	6%
2	Fernwood Rd	N/A	16,541	N/A	N/A
3	Rockledge Dr	N/A	6,459	N/A	N/A
4	Democracy Blvd	31,000	29,864	-1,136	-4%
5	Capital Beltway	119,170	139,201	20,031	17%
6	Greentree Rd	N/A	5,803	N/A	N/A
7	Bradley Blvd	15,262	9,689	-5,573	-37%
8	Wilson La	9,654	15,157	5,503	57%
	Subtotal*	294,286	319,958	25,672	9%

Screenline I-495-4

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Randolph Rd	28,240	53,714	25,474	90%
2	Lindell St	N/A	5,764	N/A	N/A
3	West University Blvd	33,810	50,111	16,301	48%
4	Veirs Mill Rd	26,446	23,982	-2,464	-9%
5	Plyers Mill Rd	N/A	11,834	N/A	N/A
6	Forest Glen Rd	9,690	7,619	-2,071	-21%
7	Capital Beltway	239,260	242,329	3,069	1%
8	Linden La	11,760	14,203	2,443	21%
9	16th St	29,402	22,993	-6,409	-22%
10	Spring St	N/A	11,561	N/A	N/A
11	East West Hwy	27,020	37,311	10,291	38%
12	Colesville Rd	16,132	20,890	4,758	29%
	Subtotal*	421,760	473,152	51,392	12%

Screenline I-495-5

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	ICC	50,724	68,638	17,914	35%
2	Randolph Rd	38,192	41,547	3,355	9%
3	Columbia Pike	65,682	94,668	28,986	44%
4	Powder Mill Rd	N/A	10,920	N/A	N/A
5	Capital Beltway	265,484	280,772	15,288	6%
6	Adelphi Rd	N/A	34,996	N/A	N/A
7	Metzerott Rd	N/A	12,672	N/A	N/A
8	Merrimac Dr	N/A	5,577	N/A	N/A
9	University Blvd	41,000	41,134	134	0%
10	Erskine St	N/A	5,327	N/A	N/A
11	East West Hwy	24,432	24,020	-412	-2%
	Subtotal*	485,514	550,779	65,265	13%

Screenline I-495-6

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Cheverly Ave	10,160	4,351	-5,809	-57%
2	Landover Rd	42,482	43,350	868	2%
3	Annapolis Rd	39,364	21,925	-17,439	-44%
4	Veterans Pkwy	23,872	13,536	-10,336	-43%
5	Riverdale Rd	N/A	15,124	N/A	N/A
6	Good Luck Rd	N/A	13,861	N/A	N/A
7	Capital Beltway	200,390	200,117	-273	0%
8	Greenbelt Rd	57,230	52,706	-4,524	-8%
9	Explorer Rd	N/A	6,098	N/A	N/A
10	Soil Conservation Rd	N/A	5,768	N/A	N/A
11	Springfield Rd	N/A	11,476	N/A	N/A
12	Laurel Bowie Rd	20,302	22,898	2,596	13%
	Subtotal*	393,800	358,883	-34,917	-9%

Screenline I-495-7

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Kenilworth Ave	175,792	142,763	-33,029	-19%
2	Columbia Park Rd	19,720	8,991	-10,729	-54%
3	Landover Rd	48,292	40,781	-7,511	-16%
4	Veterans Pkwy	N/A	7,631	N/A	N/A
5	Ardwick-Ardmore Rd	9,482	10,432	950	10%
6	Capital Beltway	222,510	224,762	2,252	1%
7	Whitfield Chapel Rd	10,400	5,326	-5,074	-49%
8	Martin Luther King Jr. Hwy	27,992	35,222	7,230	26%
9	Lottsford Vista Rd	10,490	8,797	-1,693	-16%
10	Enterprise Rd	17,272	13,062	-4,210	-24%
11	Church Rd	6,020	5,769	-251	-4%
12	Collington Rd	N/A	39,621	N/A	N/A
13	Crain Hwy	64,452	51,068	-13,384	-21%
	Subtotal*	612,422	546,973	-65,449	-11%

Screenline I-495-8

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Anacostia Fwy	109,904	80,120	-29,784	-27%
2	Minnesota St	N/A	23,542	N/A	N/A
3	Ridge Rd SE	N/A	10,196	N/A	N/A
4	Texas Ave SE	6,378	1,295	-5,083	-80%
5	Benning Rd SE	16,718	15,226	-1,492	-9%
6	F St SE	N/A	4,887	N/A	N/A
7	Southern Ave SE	13,476	26,644	13,168	98%
8	Larchmont Ave	N/A	10,022	N/A	N/A
9	Suffolk Ave	N/A	3,359	N/A	N/A
10	Rollins Ave	N/A	1,464	N/A	N/A
11	Addison Rd	19,492	18,029	-1,463	-8%
12	Shady Glen Dr	N/A	11,719	N/A	N/A
13	Ritchie Rd	N/A	18,853	N/A	N/A
14	Capital Beltway	218,552	194,646	-23,906	-11%
15	Harry S Truman Dr	N/A	18,243	N/A	N/A
16	Largo Rd	41,842	30,752	-11,090	-27%
17	Campus Way S	N/A	9,415	N/A	N/A
18	Kettering Dr	N/A	5,687	N/A	N/A
19	Watkins Park Dr	15,224	14,985	-239	-2%
20	Church Rd	N/A	3,555	N/A	N/A
21	Crain Hwy	55,382	54,554	-828	-1%
	Subtotal*	496,968	436,251	-60,717	-12%

Screenline I-495-9

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Suitland Pkwy	36,772	19,064	-17,708	-48%
2	Silver Hill Rd	42,240	35,780	-6,460	-15%
3	Auth Rd	N/A	8,868	N/A	N/A
4	Capital Beltway	197,600	167,731	-29,869	-15%
5	Allentown Rd	35,072	30,137	-4,935	-14%
6	Old Alexander Ferry Rd	N/A	14,527	N/A	N/A
7	Woodyard Rd	19,962	16,587	-3,375	-17%
8	Surratts Rd	N/A	2,656	N/A	N/A
9	Dyson Rd	N/A	1,351	N/A	N/A
10	Mattawoman Dr	N/A	835	N/A	N/A
11	Crain Hwy	31,280	29,220	-2,060	-7%
	Subtotal*	362,926	298,519	-64,407	-18%

Table 2c. Observed versus Simulated AAWDT Volumes by Facility for MD 295 Screenlines; 2016 Validation

Screenline MD-295-1

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	I-95	207,324	261,557	54,233	26%
2	Washington Blvd	38,432	42,076	3,644	9%
3	MD 295	108,450	92,585	-15,865	-15%
4	Aviation Blvd	20,480	30,216	9,736	48%
5	Aviation Ave	21,070	13,998	-7,072	-34%
6	I-97	111,820	127,029	15,209	14%
	Subtotal*	507,576	567,461	59,885	12%

Screenline MD-295-2

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Columbia Pike	91,082	113,681	22,599	25%
2	Broken Land Pkwy	N/A	38,247	N/A	N/A
3	I-95	217,540	275,040	57,500	26%
4	Washington Blvd	27,222	44,416	17,194	63%
5	Brock Bridge Rd	N/A	7,323	N/A	N/A
6	MD 295	121,752	107,288	-14,464	-12%
7	Annapolis Rd	N/A	16,755	N/A	N/A
8	Telegraph Rd	25,192	35,271	10,079	40%
9	Clark Station Rd	N/A	6,027	N/A	N/A
10	New Cut Rd	12,052	15,213	3,161	26%
11	I-97	127,602	147,304	19,702	15%
	Subtotal*	622,442	738,213	115,771	19%

Screenline MD-295-3

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Columbia Pike	62,110	100,131	38,021	61%
2	I-95	206,640	246,573	39,933	19%
3	Old Gunpowder Rd	N/A	18,846	N/A	N/A
4	Virginia Manor Rd	N/A	15,538	N/A	N/A
5	Baltimore Ave	34,512	44,602	10,090	29%
6	Montpelier Dr	N/A	7,098	N/A	N/A
7	Muirkirk Rd	N/A	9,646	N/A	N/A
8	Laurel Bowie Rd	57,132	43,785	-13,347	-23%
9	MD 295	105,852	95,239	-10,613	-10%
	Subtotal*	466,246	530,330	64,084	14%

Screenline MD-295-4

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Columbia Pike	72,572	91,472	18,900	26%
2	New Hampshire Ave	57,900	85,273	27,373	47%
3	Riggs Rd	N/A	14,910	N/A	N/A
4	Cherry Hill Rd	22,004	19,613	-2,391	-11%
5	I-95	200,180	245,573	45,393	23%
6	Sellman Rd	N/A	2,088	N/A	N/A
7	Baltimore Ave	47,640	64,308	16,668	35%
8	Rhode Island Ave	N/A	4,942	N/A	N/A
9	Cherrywood La	9,552	10,236	684	7%
10	Kenilworth Ave	36,330	31,675	-4,655	-13%
11	Greenbelt Rd	52,230	41,038	-11,192	-21%
12	MD 295	128,132	105,196	-22,936	-18%
13	Good Luck Rd	N/A	13,599	N/A	N/A
14	Annapolis Rd	69,420	48,459	-20,961	-30%
	Subtotal*	695,960	742,843	46,883	7%

Screenline MD-295-5

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Baltimore Ave	37,092	51,194	14,102	38%
2	Kenilworth Ave	41,110	27,678	-13,432	-33%
3	MD 295	113,764	88,878	-24,886	-22%
4	Capital Beltway	200,390	200,117	-273	0%
	Subtotal*	392,356	367,867	-24,489	-6%

Screenline MD-295-6

Sequence	Facility	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	Bladenburg Rd	16,716	23,943	7,227	43%
2	Kenilworth Ave	33,510	38,037	4,527	14%
3	MD 295	123,292	101,045	-22,247	-18%
4	Cheverly Ave	10,160	4,351	-5,809	-57%
5	Landover Rd	42,482	43,350	868	2%
6	Cooper Lane	N/A	4,993	N/A	N/A
7	Veterans Pkwy	N/A	25,671	N/A	N/A
8	Capital Beltway	216,120	212,565	-3,555	-2%
	Subtotal*	442,280	423,291	-18,989	-4%

Note: * Links with no count are excluded from screenline subtotals.

Table 3a. Observed versus Simulated AAWDT Volumes on I-270; 2016 Validation

Sequence	Location	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	IS270-.40 MI S OF NEW DESIGN RD	117,990	140,948	22,958	19%
2	IS270-.20 MI S OF BAKER VALLEY RD	90,110	117,287	27,177	30%
3	IS270-50ft S OF FREDERICK CO/L	85,730	124,562	38,832	45%
4	IS270-.50 MI N OF MD121	83,930	127,837	43,907	52%
5	IS 270 South of MD 121 (ATR#04)	105,544	141,566	36,022	34%
6	IS270-.40 MI N OF MD118	121,110	147,808	26,698	22%
7	IS270-.30 MI S OF MD118	136,930	158,538	21,608	16%
8	IS270-.50 MI S OF MIDDLEBROOK RD	175,364	190,777	15,413	9%
9	IS270-.30 MI S OF MD124	183,660	210,107	26,447	14%
10	IS270-.50 MI N OF IS370	231,120	237,465	6,345	3%
11	IS270-.30 MI N OF SHADY GROVE RD	224,730	231,337	6,607	3%
12	IS270-.50 MI N OF MD28	224,250	247,714	23,464	10%
13	IS270-.30 MI S OF MD28	248,810	287,651	38,841	16%
14	IS270-.30 MI N OF MD927 (MONTROSE RD)	263,740	291,427	27,687	10%
15	IS270-.10 MI N OF TUCKERMAN LA	268,380	293,792	25,412	9%
16	IS270Y-.30 MI N OF WESTLAKE TERR	131,850	167,745	35,895	27%
17	IS270Y-.40 MI S OF DEMOCRACY BLVD	133,170	177,952	44,782	34%
18	IS270-.30 MI N OF MD187B	119,200	126,047	6,847	6%
19	IS270-.10 MI S OF MD187	112,380	105,487	-6,893	-6%

Table 3b. Observed versus Simulated AAWDT Volumes on Capital Beltway; 2016 Validation

Sequence	Location	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	IS495-.10 MI E OF PERSIMMON TREE RD	231,716	239,294	7,578	3%
2	IS495-.70 MI N OF MD190	262,112	317,153	55,041	21%
3	IS495-.50 MI W OF MD187	119,170	139,201	20,031	17%
4	IS495-.30 MI E OF MD187	112,890	134,833	21,943	19%
5	IS495-.20 MI E OF MD355	223,330	244,879	21,549	10%
6	IS495-.80 MI W OF MD97	239,260	242,329	3,069	1%
7	IS495-.20 MI E OF MD97	229,740	234,955	5,215	2%
8	IS495-.20 MI E OF US29	219,320	225,967	6,647	3%
9	IS 495 West of MD 650 (ATR#41)	215,924	237,779	21,855	10%
10	IS495-.10 MI W OF MD212	265,484	280,772	15,288	6%
11	IS95-.30 MI N OF US1	212,110	227,076	14,966	7%
12	IS95-.40 MI S OF US1	223,590	201,338	-22,252	-10%
13	IS95-.30 MI N OF MD201	216,200	191,155	-25,045	-12%
14	IS95-.30 MI S OF MD201	207,020	199,218	-7,802	-4%
15	IS 95 North of Good Luck Rd (ATR#55)	200,390	200,117	-273	0%
16	IS95-.60 MI N OF IS595/US50	216,120	212,565	-3,555	-2%
17	IS95-.10 MI S OF MD704	222,510	224,762	2,252	1%
18	IS95-.40 MI S OF MD202	208,610	214,610	6,000	3%
19	IS 95 South of MD 214 (ATR#43)	218,552	194,646	-23,906	-11%
20	IS95-.50 MI N OF MD4	227,452	193,249	-34,203	-15%
21	IS95-.40 MI S OF MD4	202,400	176,319	-26,081	-13%
22	IS95-.40 MI N OF MD5	197,600	167,731	-29,869	-15%
23	IS 95 at Temple Hill Rd (ATR#49)	162,226	149,136	-13,090	-8%
24	IS95-.40 MI S OF MD414	170,630	148,784	-21,846	-13%
25	IS95-.30 MI S OF MD210	175,912	172,551	-3,361	-2%
26	IS95-.50 MI N OF VIRGINIA ST/L	214,292	222,444	8,152	4%

Table 3c. Observed versus Simulated AAWDT Volumes on MD 295; 2016 Validation

Sequence	Location	2015 Obs. Vol	2016 Sim. Vol	Difference	% Diff.
1	MD295-.10 MI S OF BALTIMORE CO/L	104,412	84,912	-19,500	-19%
2	MD295-.20 MI S OF IS695	99,332	73,695	-25,637	-26%
3	MD295-.60 MI N OF IS195	121,920	74,891	-47,029	-39%
4	MD295-.30 MI N OF MD100	108,450	92,585	-15,865	-15%
5	MD295-.60 MI S OF MD100	109,500	103,443	-6,057	-6%
6	MD295-.25 MI S OF MD175	121,752	107,288	-14,464	-12%
7	MD295-.50 MI S OF MD32	112,552	115,358	2,806	2%
8	MD295-.30 MI N OF MD197	105,852	95,239	-10,613	-10%
9	MD295-.60 MI S OF MD197	117,252	105,206	-12,046	-10%
10	MD295-.40 MI N OF MD193	110,372	91,028	-19,344	-18%
11	MD295-.30 MI N OF IS95	128,132	105,196	-22,936	-18%
12	MD295-.30 MI S OF IS95	113,764	88,878	-24,886	-22%
13	MD295-.20 MI N OF MD450	118,780	90,848	-27,932	-24%
14	MD295-.20 MI N OF MD202	117,960	101,312	-16,648	-14%
15	MD295-.50 MI N OF US50	123,292	101,045	-22,247	-18%

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Carole Delion, Lisa Shemer, Subrat Mahapatra, MD SHA, Kari Snyder, MDOT
FROM: Dusan Vuksan, Feng Xie, Yu Gao, TPB Staff
SUBJECT: Alternative 1 / No Build for the Traffic Relief Plan
DATE: March 22, 2018
CC: Tim Canan, Ron Milone, Anant Choudhary, TPB Staff

This memorandum documents the TPB staff's 2040 Alternative 1 / No Build efforts related to the Traffic Relief Plan. It provides draft Alternative 1 results and a list of regional model output files that are being transmitted at this time.

PROJECT BACKGROUND

The Maryland State Highway Administration (SHA) has requested TPB staff assistance in preparing travel demand forecasts for different future alternatives and strategies for Maryland's Traffic Relief Plan. Although the project assumptions are still evolving, the project aims to assess the impacts of addition of dynamically priced lanes on Capital Beltway (I-495), I-270, and MD-295. It is being led by SHA with consulting support from Gannett Fleming. TPB staff work is being funded by the Maryland portion of the state Technical Assistance Program within the Unified Planning Work Program (UPWP).

VALIDATION TRANSMITTAL

Following the Model Validation transmittal on February 23, 2018, TPB staff completed Alternative 1 / No Build forecasts for the Traffic Relief Plan and prepared draft summaries, attached as an appendix to this transmittal memorandum. The summaries show changes in traffic across the screenlines between 2016 Model Validation (base year) and 2040 Alternative 1 (out year). Alternative 1 is critical as all build alternatives forecasts will be evaluated against it. The appendix also includes the maps of study area and screenlines (Maps 1 and 2). TPB staff is transmitting the following model output files based on the regional model output:

- I4_assign_output.net (Final Loaded Network)
- i4_AM.VTT (Origin / Destination AM vehicle trip table)
- i4_PM.VTT (Origin / Destination PM vehicle trip table)
- i4_MD.VTT (Origin / Destination mid-day vehicle trip table)
- i4_NT.VTT (Origin / Destination night-time vehicle trip table)

The files can be accessed using the following ftp link:

ftp://dtpcog:cog.dtp@ftp.mwcog.org/MD_SHA_TRP_Study_2040_Alt1_Model_Files.zip

ASSUMPTIONS

The Traffic Relief Plan Study inputs were based on Round 9.0 Cooperative Forecasts and the 2016 "Off-Cycle" Constrained Long Range Plan (adopted in October 2017). The highway network refinements that were implemented in the Model Validation base year networks were carried to the 2040 Alternative 1 /No Build networks as well. They include:

- Review and revisions of the number of lanes on I-495, I-270 and MD-295
- Review and revisions of coding of interchanges with access to/from the above freeways
- Additional refinements in the Fort Meade area (existing NSA interchange added)
- Decrease in highway capacity on MD-295 (degraded from freeway to expressway)

Given the project schedule-related time constraints, the refinements do not include:

- Revisions in external trips mainly impacting MD-295 and I-270 (discussed at one point)
- Zone splits and centroid connector revisions (except for the Fort Meade area)
- Detailed review and revisions of coding of intersecting facilities

In addition to the network revisions of the existing facilities noted above that were first implemented in Model validation, the following assumptions were made in Alternative 1:

- CLRP projects on I-270, Capital Beltway in Maryland and MD-295 are not included, except for:
  - I-270 Innovative Congestion Management improvements (some of which result in additional capacity through implementation of auxiliary lanes)
  - Watkins Mill Road Interchange (I-270)
  - Corridor Cities Transitway (near I-270) and other transit projects in the corridor
  - Greenbelt Metro Station access improvement (I-495)
- Virginia HOT Lanes terminate just to the north of Dulles Toll Road (same as today)
  - However, CLRP projects on the Capital Beltway general purpose lanes between Dulles Toll Road and the American Legion Bridge are included (additional capacity via auxiliary lanes)
- CLRP assumptions are assumed elsewhere in the region, including some of the roadways intersecting the three TRP facilities (e.g., US 15, I-70, etc.).
- Consistent with today's operations, trucks are not allowed on MD-295

Version 2.3.70 travel demand model is the official TPB "production model". Although this model was used as the starting point "base" model, it was subsequently revised to be able to better represent dynamically-priced lanes that do not provide preferential treatment to the high occupancy vehicles (which may be assumed in a number of build alternatives for the project). Essentially, to reflect this policy change, TPB staff removed what is known as the "HOV Skim Replacement" process, with the revised model no longer requiring the "base-run" modeling step for each analysis year. At the same time, the revised model still provides preferential treatment to the carpools on HOT lane facilities in Virginia, as HOV users of Virginia HOT lanes are able to access them free of charge. The resulting model used in preparation of the 2040 Alternative 1 /No Build estimates will be referred to as the

Version 2.3.71 travel demand model. Depending on the final build alternatives assumptions, this model may need to be refined further.

DRAFT RESULTS

Model results and summaries are included in the appendix. The summaries provide comparisons of estimated 2040 Alternative 1 and 2016 Model Validation traffic. These findings are included to help evaluate the traffic growth in different corridors in Maryland.

The TRP comparisons largely focus on the screenlines that were selected in consultation with SHA. It is important to note that the facilities for which observed data were unavailable were excluded from the estimated-versus-observed volume comparisons in Model Validation (February 23 transmittal). However, for the purposes of simulated-versus-simulated traffic volume comparisons (such as the summaries included in this memo and in future build alternatives), all facilities are included. This ensures that any new CLRP projects that intersect the screenlines are included in assessments of traffic growth between the alternatives.

Tables 1 and 2 show differences between estimated volumes at the screenline level (Map 2). In terms of the percentages, generally, more significant traffic volume growth (greater than 15%) can be observed in the areas of Maryland that are less developed and farther removed from the urban core. At the same time, lower volume growth between now and 2040 can be observed on the screenlines that encompass more developed areas around the Beltway, including Bethesda, Silver Spring, Wheaton, College Park and New Carrollton (less than 10%). The screenline traffic growth is also influenced by any expansion of highway capacity on the screenline facilities and addition of new projects that are in close proximity to the screenlines but not included in them.

Finally, some of the non-freeway links show decreases in volumes between now and 2040 (Tables 1 and 2). This occurs either due to the improvements to nearby facilities, construction of new projects that divert traffic from the existing facilities, or due to increases in population and employment densities that reduce roadway capacity (or in modeling terms, changes in “area type”).

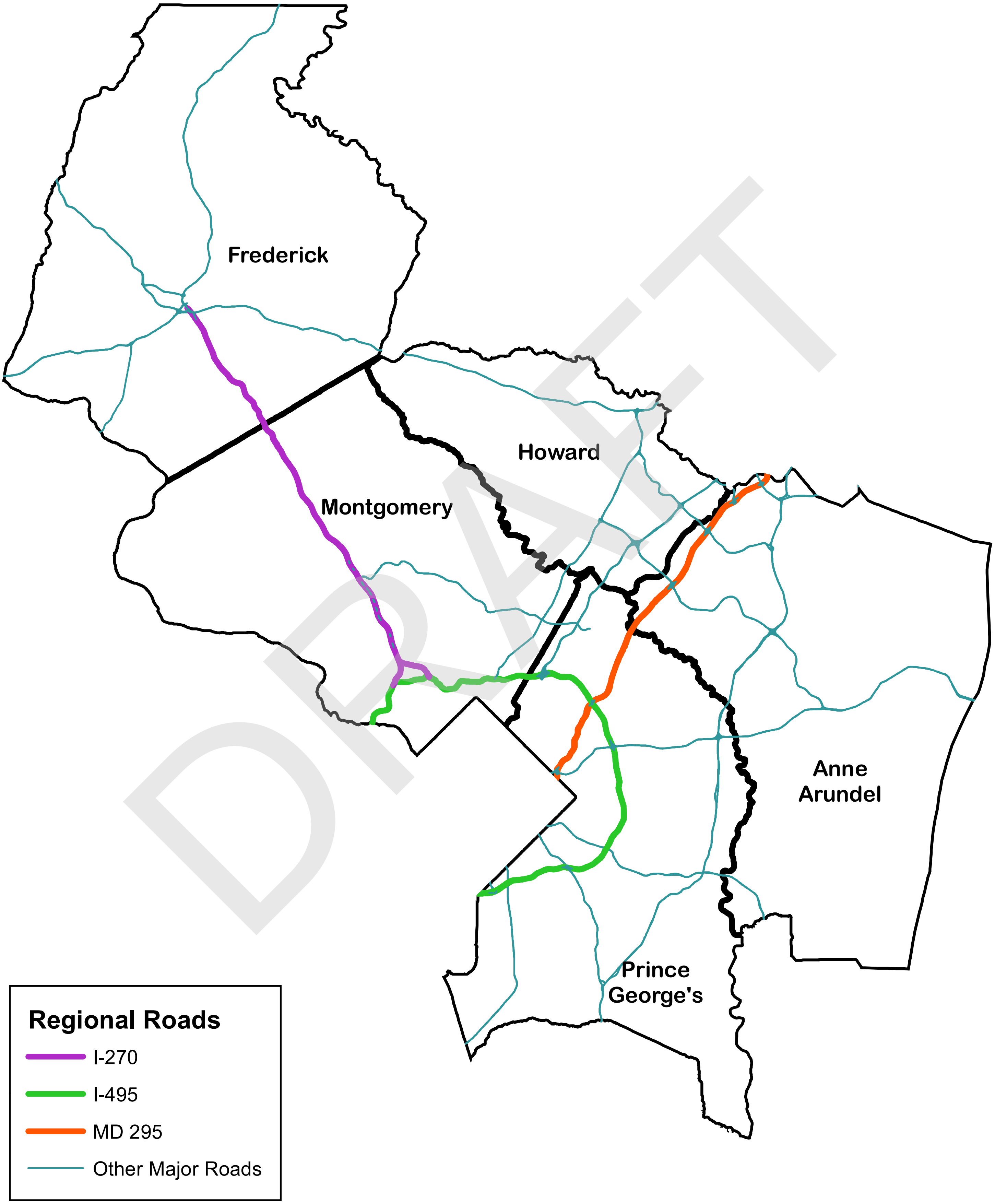
Similar patterns can be observed with respect to the link-level output (Tables 3a, 3b and 3c).

NEXT STEPS

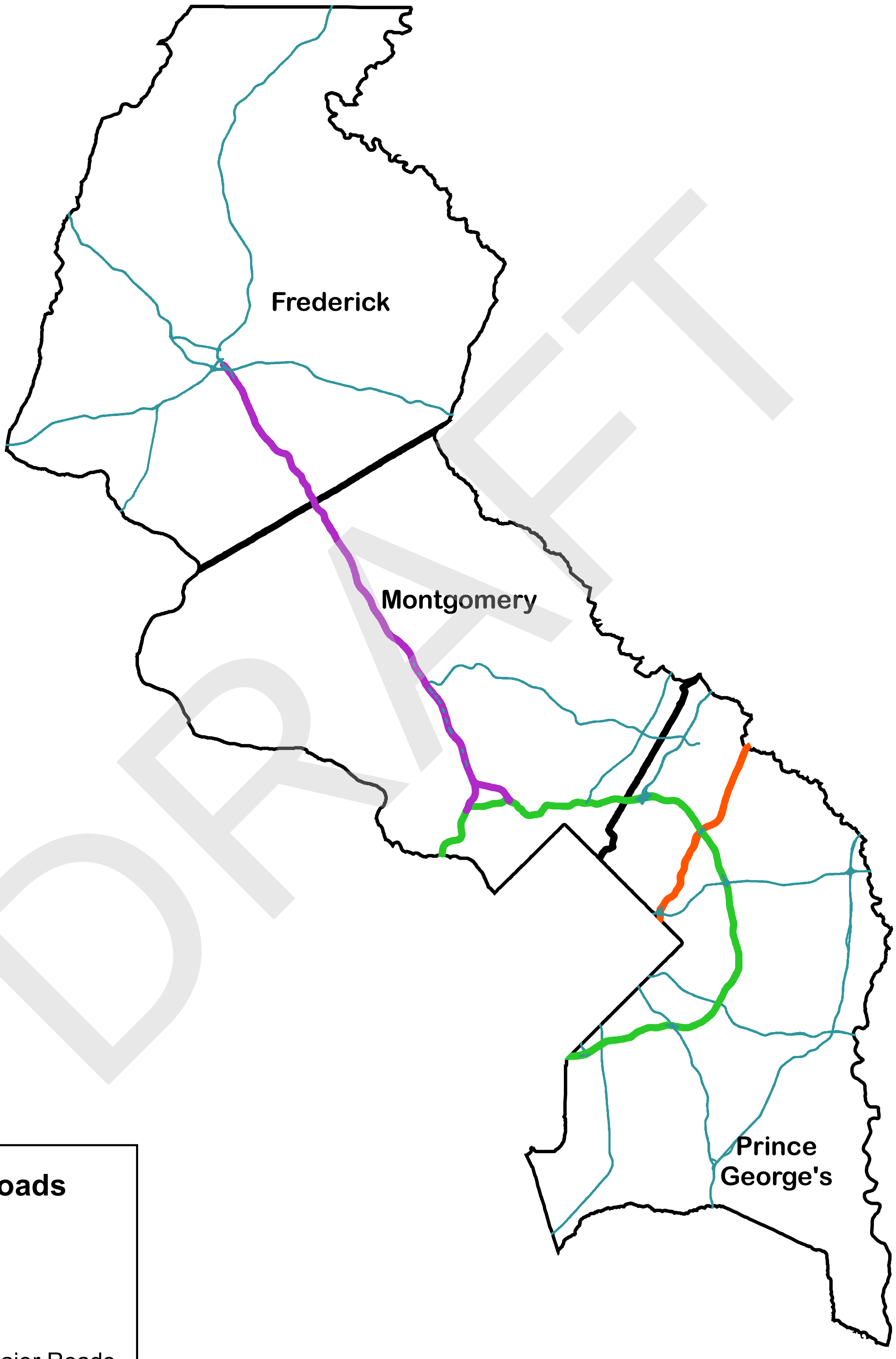
TPB staff looks forward to receiving feedback from SHA staff. If current model validation output is acceptable to SHA for the purposes of post-processing, TPB staff will move forward and execute the 2040 build alternatives.

APPENDIX

Map 1a. Maryland Traffic Relief Plan Study Area



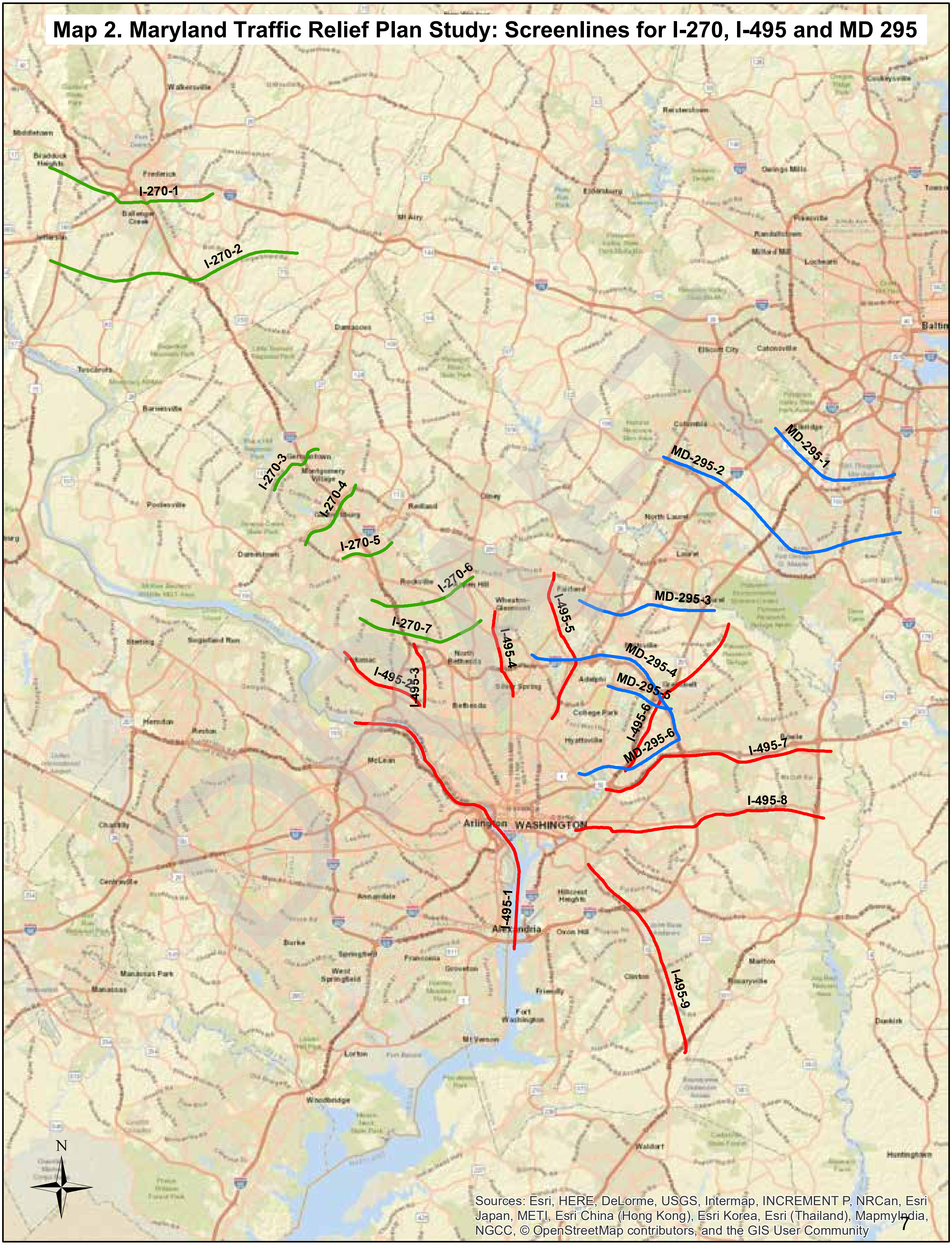
Map 1b. Maryland Traffic Relief Plan Focused Study Area



Regional Roads

- I-270
- I-495
- MD 295
- Other Major Roads

Map 2. Maryland Traffic Relief Plan Study: Screenlines for I-270, I-495 and MD 295



Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

Table 1. 2016 Validation versus 2040 Alternative 1/True No Build Simulated AAWDT Volumes* by Screenline

Screenline ID	Location	2016	2040 Alt 1	Difference	% Difference
I-270-1	South of I-70	308,868	389,806	80,938	26%
I-270-2	North of Fingerboard Rd	207,178	247,339	40,161	19%
I-270-3	South of Germantown Rd	249,901	270,202	20,301	8%
I-270-4	South of Quince Orchard Rd	363,164	427,742	64,578	18%
I-270-5	South of I-370	363,635	423,624	59,989	16%
I-270-6	North of Montrose Rd	530,793	588,394	57,601	11%
I-270-7	North of the Spurs	535,025	604,483	69,458	13%
I-495-1	Potomac River	935,888	1,054,571	118,683	13%
I-495-2	North of River Rd	378,771	417,362	38,591	10%
I-495-3	Between the Spurs	348,761	376,816	28,055	8%
I-495-4	West of Georgia Ave	502,311	538,443	36,132	7%
I-495-5	East of New Hampshire Ave	620,271	671,641	51,370	8%
I-495-6	East of Baltimore Washington Pkwy	411,210	448,946	37,736	9%
I-495-7	South of US 50	594,225	660,440	66,215	11%
I-495-8	South of Central Ave	557,193	614,266	57,073	10%
I-495-9	East of Branch Ave	326,756	379,544	52,788	16%
MD-295-1	North of Dorsey Rd	567,461	645,621	78,160	14%
MD-295-2	North of Patuxent Pkwy	806,565	921,108	114,543	14%
MD-295-3	South of ICC	581,458	651,186	69,728	12%
MD-295-4	North of Capital Beltway	778,382	842,627	64,245	8%
MD-295-5	South of University Blvd	367,867	395,368	27,501	7%
MD-295-6	North of US 50	453,955	483,122	29,167	6%

Note: * All links on the screenlines are included.

Table 2a. 2016 vs. 2040 Alt 1 Simulated AAWDT Volumes by Facility for I-270 Screenlines

Screenline I-270-1

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Jefferson Blvd	924	1,498	574	62%
2	Old Swimming Pool Rd	928	1,553	625	67%
3	Jefferson Pike	3,284	7,046	3,762	115%
4	US-15	91,962	113,502	21,540	23%
5	Balenger Creek Pike	9,727	11,456	1,729	18%
6	New Design Rd	19,136	21,862	2,726	14%
7	I-270	140,948	169,723	28,775	20%
8	Buckeystown Pike	21,490	33,024	11,534	54%
9	Urbana Pike	12,712	17,517	4,805	38%
10	Reichs Ford Rd	3,119	4,452	1,333	43%
11	Old National Pike	4,638	8,172	3,534	76%
	Subtotal*	308,868	389,806	80,938	26%

Screenline I-270-2

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Catoctin Mountain Hwy	29,767	32,326	2,559	9%
2	Ballenger Creek Pike	3,991	5,998	2,007	50%
3	New Design Rd	2,970	5,309	2,339	79%
4	Buckeystown Pike	10,242	15,558	5,316	52%
5	Park Mills Rd	2,708	4,117	1,409	52%
6	I-270	117,287	131,876	14,589	12%
7	Urbana Pike	9,444	9,965	521	6%
8	Sugarloaf Pkwy	702	882	180	26%
9	Ijamsville Rd	8,259	15,107	6,848	83%
10	Ed McClain Rd	4,222	7,263	3,041	72%
11	Green Valley Rd	17,586	18,938	1,352	8%
	Subtotal*	207,178	247,339	40,161	19%

Screenline I-270-3

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Clopper Rd	26,008	21,257	-4,751	-18%
2	Wisteria Dr	394	975	581	147%
3	Middlebrook Rd	17,162	32,709	15,547	91%
4	I-270	158,538	178,758	20,220	13%
5	Frederick Rd	47,799	36,503	-11,296	-24%
	Subtotal*	249,901	270,202	20,301	8%

Screenline I-270-4

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Darnestown Rd	33,296	31,186	-2,110	-6%
2	Great Seneca Hwy	31,364	35,414	4,050	13%
3	West Diamond Ave	35,977	35,201	-776	-2%
4	I-270	210,107	254,437	44,330	21%
5	North Frederick Ave	32,181	36,720	4,539	14%
6	Lost Knife Rd	3,791	3,476	-315	-8%
7	Midcounty Hwy	16,448	31,307	14,859	90%
	Subtotal*	363,164	427,742	64,578	18%

Screenline I-270-5

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Great Seneca Hwy	26,107	25,013	-1,094	-4%
2	Omega Rd	6,779	12,641	5,862	86%
3	Shady Grove Rd	34,449	34,221	-228	-1%
4	I-270	247,714	293,859	46,145	19%
5	Piccard Dr	7,442	9,513	2,071	28%
6	Gaither Rd	6,646	8,930	2,284	34%
7	Grand Champion Dr	741	1,101	360	49%
8	Frederick Rd	33,757	38,346	4,589	14%
	Subtotal*	363,635	423,624	59,989	16%

Screenline I-270-6

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Falls Rd	18,481	19,251	770	4%
2	Seven Locks Rd	28,829	31,197	2,368	8%
3	I-270	291,427	335,117	43,690	15%
4	Tower Oaks Blvd	11,772	14,748	2,976	25%
5	Rockville Pike	42,255	49,314	7,059	17%
6	Twinbrook Pkwy	24,633	23,963	-670	-3%
7	Veirs Mill Rd	48,481	41,768	-6,713	-14%
8	Bauer Dr	3,574	4,764	1,190	33%
9	Georgia Ave	61,341	68,274	6,933	11%
	Subtotal*	530,793	588,394	57,601	11%

Screenline I-270-7

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Falls Rd	23,256	24,459	1,203	5%
2	Seven Locks Rd	20,802	20,330	-472	-2%
3	I-270	293,792	335,698	41,906	14%
4	Old Georgetown Rd	38,956	49,086	10,130	26%
5	Rockville Pike	50,980	61,394	10,414	20%
6	Connecticut Ave	57,626	59,819	2,193	4%
7	Veirs Mill Rd	49,613	53,697	4,084	8%
	Subtotal*	535,025	604,483	69,458	13%

Table 2b. 2016 vs. 2040 Alt 1 Simulated AAWDT Volumes by Facility for I-495 Screenlines

Screenline I-495-1

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	American Legion Bridge	282,575	320,989	38,414	14%
2	Chain Bridge	35,831	43,420	7,589	21%
3	Key Bridge	54,124	55,159	1,035	2%
4	Roosevelt Bridge	99,980	115,955	15,975	16%
5	Memorial Bridge	58,490	69,430	10,940	19%
6	14th Street Bridge	182,444	195,026	12,582	7%
7	Woodrow Wilson Bridge	222,444	254,592	32,148	14%
	Subtotal*	935,888	1,054,571	118,683	13%

Screenline I-495-2

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Falls Rd	16,675	19,348	2,673	16%
2	Bradley Blvd	10,447	11,600	1,153	11%
3	Seven Locks Rd	14,364	16,706	2,342	16%
4	Capital Beltway	317,153	344,957	27,804	9%
5	Burdette Rd	6,957	9,395	2,438	35%
6	Wilson La	13,175	15,356	2,181	17%
	Subtotal*	378,771	417,362	38,591	10%

Screenline I-495-3

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	I-270 East Spur	126,047	136,806	10,759	9%
2	Fernwood Rd	16,541	17,908	1,367	8%
3	Rockledge Dr	6,459	8,046	1,587	25%
4	Democracy Blvd	29,864	33,803	3,939	13%
5	Capital Beltway	139,201	146,814	7,613	5%
6	Greentree Rd	5,803	7,683	1,880	32%
7	Bradley Blvd	9,689	10,256	567	6%
8	Wilson La	15,157	15,500	343	2%
	Subtotal*	348,761	376,816	28,055	8%

Screenline I-495-4

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Randolph Rd	53,714	60,658	6,944	13%
2	Lindell St	5,764	6,075	311	5%
3	West University Blvd	50,111	55,033	4,922	10%
4	Veirs Mill Rd	23,982	27,143	3,161	13%
5	Plyers Mill Rd	11,834	12,217	383	3%
6	Forest Glen Rd	7,619	8,263	644	8%
7	Capital Beltway	242,329	250,875	8,546	4%
8	Linden La	14,203	14,742	539	4%
9	16th St	22,993	28,159	5,166	22%
10	Spring St	11,561	13,047	1,486	13%
11	East West Hwy	37,311	38,973	1,662	4%
12	Colesville Rd	20,890	23,259	2,369	11%
	Subtotal*	502,311	538,443	36,132	7%

Screenline I-495-5

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	ICC	68,638	81,909	13,271	19%
2	Randolph Rd	41,547	45,633	4,086	10%
3	Columbia Pike	94,668	102,984	8,316	9%
4	Powder Mill Rd	10,920	10,981	61	1%
5	Capital Beltway	280,772	292,711	11,939	4%
6	Adelphi Rd	34,996	39,190	4,194	12%
7	Metzerott Rd	12,672	16,790	4,118	32%
8	Merrimac Dr	5,577	6,447	870	16%
9	University Blvd	41,134	40,393	-741	-2%
10	Erskine St	5,327	6,313	986	19%
11	East West Hwy	24,020	28,290	4,270	18%
	Subtotal*	620,271	671,641	51,370	8%

Screenline I-495-6

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Cheverly Ave	4,351	4,693	342	8%
2	Landover Rd	43,350	47,412	4,062	9%
3	Annapolis Rd	21,925	24,139	2,214	10%
4	Veterans Pkwy	13,536	15,104	1,568	12%
5	Riverdale Rd	15,124	15,434	310	2%
6	Good Luck Rd	13,861	20,899	7,038	51%
7	Capital Beltway	200,117	212,342	12,225	6%
8	Greenbelt Rd	52,706	53,577	871	2%
9	Explorer Rd	6,098	6,940	842	14%
10	Soil Conservation Rd	5,768	8,024	2,256	39%
11	Springfield Rd	11,476	13,910	2,434	21%
12	Laurel Bowie Rd	22,898	26,472	3,574	16%
	Subtotal*	411,210	448,946	37,736	9%

Screenline I-495-7

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Kenilworth Ave	142,763	149,482	6,719	5%
2	Columbia Park Rd	8,991	13,467	4,476	50%
3	Landover Rd	40,781	46,833	6,052	15%
4	Veterans Pkwy	7,631	8,716	1,085	14%
5	Ardwick-Ardmore Rd	10,432	10,303	-129	-1%
6	Capital Beltway	224,762	240,128	15,366	7%
7	Whitfield Chapel Rd	5,326	7,303	1,977	37%
8	Martin Luther King Jr. Hwy	35,222	38,586	3,364	10%
9	Lottsford Vista Rd	8,797	13,560	4,763	54%
10	Enterprise Rd	13,062	15,021	1,959	15%
11	Church Rd	5,769	8,514	2,745	48%
12	Collington Rd	39,621	44,804	5,183	13%
13	Crain Hwy	51,068	63,723	12,655	25%
	Subtotal*	594,225	660,440	66,215	11%

Screenline I-495-8

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Anacostia Fwy	80,120	78,339	-1,781	-2%
2	Minnesota St	23,542	22,061	-1,481	-6%
3	Ridge Rd SE	10,196	10,230	34	0%
4	Texas Ave SE	1,295	2,597	1,302	101%
5	Benning Rd SE	15,226	18,359	3,133	21%
6	F St SE	4,887	6,130	1,243	25%
7	Southern Ave SE	26,644	31,382	4,738	18%
8	Larchmont Ave	10,022	11,528	1,506	15%
9	Suffolk Ave	3,359	4,986	1,627	48%
10	Rollins Ave	1,464	3,588	2,124	145%
11	Addison Rd	18,029	22,323	4,294	24%
12	*Karen Blvd (Not Coded in 2016)*	*N/A*	*8,044*	*N/A*	*N/A*
13	Shady Glen Dr	11,719	10,662	-1,057	-9%
14	Ritchie Rd	18,853	22,544	3,691	20%
15	Capital Beltway	194,646	214,922	20,276	10%
16	Harry S Truman Dr	18,243	18,562	319	2%
17	Largo Rd	30,752	23,608	-7,144	-23%
18	Campus Way S	9,415	10,493	1,078	11%
19	Kettering Dr	5,687	8,412	2,725	48%
20	Watkins Park Dr	14,985	16,106	1,121	7%
21	Church Rd	3,555	7,234	3,679	103%
22	Crain Hwy	54,554	62,156	7,602	14%
	Subtotal*	557,193	614,266	57,073	10%

Screenline I-495-9

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Suitland Pkwy	19,064	21,959	2,895	15%
2	Silver Hill Rd	35,780	43,282	7,502	21%
3	Auth Rd	8,868	12,583	3,715	42%
4	*I-495 to Branch Ave. Metro Connection (New Facility)*	*N/A*	*4,305*	*N/A*	*N/A*
5	Capital Beltway	167,731	180,479	12,748	8%
6	Allentown Rd	30,137	41,675	11,538	38%
7	Old Alexander Ferry Rd	14,527	16,593	2,066	14%
8	Woodyard Rd	16,587	20,095	3,508	21%
9	Surratts Rd	2,656	3,405	749	28%
10	Dyson Rd	1,351	3,467	2,116	157%
11	Mattawoman Dr	835	2,309	1,474	177%
12	Crain Hwy	29,220	29,392	172	1%
	Subtotal*	326,756	379,544	52,788	16%

Table 2c. 2016 vs. 2040 Alt 1 Simulated AAWDT Volumes by Facility for MD 295 Screenlines

Screenline MD-295-1

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	I-95	261,557	284,092	22,535	9%
2	Washington Blvd	42,076	47,165	5,089	12%
3	MD 295	92,585	106,492	13,907	15%
4	Aviation Blvd	30,216	42,147	11,931	39%
5	Aviation Ave	13,998	20,239	6,241	45%
6	I-97	127,029	145,486	18,457	15%
	Subtotal*	567,461	645,621	78,160	14%

Screenline MD-295-2

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Columbia Pike	113,681	124,981	11,300	10%
2	Broken Land Pkwy	38,247	49,628	11,381	30%
3	I-95	275,040	293,151	18,111	7%
4	Washington Blvd	44,416	43,040	-1,376	-3%
5	Brock Bridge Rd	7,323	9,152	1,829	25%
6	MD 295	107,288	119,185	11,897	11%
7	Annapolis Rd	16,755	53,827	37,072	221%
8	Telegraph Rd	35,271	36,909	1,638	5%
9	Clark Station Rd	6,027	7,872	1,845	31%
10	New Cut Rd	15,213	19,213	4,000	26%
11	I-97	147,304	164,150	16,846	11%
	Subtotal*	806,565	921,108	114,543	14%

Screenline MD-295-3

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Columbia Pike	100,131	106,551	6,420	6%
2	I-95	246,573	261,824	15,251	6%
3	Old Gunpowder Rd	18,846	30,414	11,568	61%
4	Virginia Manor Rd	15,538	17,044	1,506	10%
5	Baltimore Ave	44,602	48,945	4,343	10%
6	*Old Baltimore Pike Extended (New Facility)*	*N/A*	*6,390*	*N/A*	*N/A*
7	Montpelier Dr	7,098	8,382	1,284	18%
8	Muirkirk Rd	9,646	11,506	1,860	19%
9	Laurel Bowie Rd	43,785	51,535	7,750	18%
10	MD 295	95,239	108,596	13,357	14%
	Subtotal*	581,458	651,186	69,728	12%

Screenline MD-295-4

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Columbia Pike	91,472	97,871	6,399	7%
2	New Hampshire Ave	85,273	87,786	2,513	3%
3	Riggs Rd	14,910	16,611	1,701	11%
4	Cherry Hill Rd	19,613	34,986	15,373	78%
5	I-95	245,573	259,564	13,991	6%
6	Sellman Rd	2,088	2,676	588	28%
7	Baltimore Ave	64,308	67,567	3,259	5%
8	Rhode Island Ave	4,942	8,626	3,684	75%
9	Cherrywood La	10,236	10,191	-45	0%
10	Kenilworth Ave	31,675	35,556	3,881	12%
11	Greenbelt Rd	41,038	41,461	423	1%
12	MD 295	105,196	109,023	3,827	4%
13	Good Luck Rd	13,599	20,439	6,840	50%
14	Annapolis Rd	48,459	50,269	1,810	4%
	Subtotal*	778,382	842,627	64,245	8%

Screenline MD-295-5

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Baltimore Ave	51,194	54,756	3,562	7%
2	Kenilworth Ave	27,678	31,358	3,680	13%
3	MD 295	88,878	96,911	8,033	9%
4	Capital Beltway	200,117	212,342	12,225	6%
	Subtotal*	367,867	395,368	27,501	7%

Screenline MD-295-6

Sequence	Facility	2016	2040 Alt 1	Difference	% Diff.
1	Bladenburg Rd	23,943	23,317	-626	-3%
2	Kenilworth Ave	38,037	40,365	2,328	6%
3	MD 295	101,045	111,094	10,049	10%
4	Cheverly Ave	4,351	4,693	342	8%
5	Landover Rd	43,350	47,412	4,062	9%
6	Cooper Lane	4,993	5,643	650	13%
7	Veterans Pkwy	25,671	28,549	2,878	11%
8	Capital Beltway	212,565	222,048	9,483	4%
	Subtotal*	453,955	483,122	29,167	6%

Note: * All links on the screenlines are included.

Table 3a. Simulated AAWDT Volumes on I-270; 2016 Validation vs. 2040 Alt 1/True No Build

Sequence	Location	2016	2040 Alt 1	Difference	% Diff.
1	IS270-.40 MI S OF NEW DESIGN RD	140,948	169,723	28,775	20%
2	IS270-.20 MI S OF BAKER VALLEY RD	117,287	131,876	14,589	12%
3	IS270-50ft S OF FREDERICK CO/L	124,562	141,024	16,461	13%
4	IS270-.50 MI N OF MD121	127,837	143,187	15,350	12%
5	IS 270 South of MD 121 (ATR#04)	141,566	164,758	23,192	16%
6	IS270-.40 MI N OF MD118	147,808	168,437	20,629	14%
7	IS270-.30 MI S OF MD118	158,538	178,758	20,220	13%
8	IS270-.50 MI S OF MIDDLEBROOK RD	190,777	207,582	16,805	9%
9	IS270-.30 MI S OF MD124	210,107	254,437	44,330	21%
10	IS270-.50 MI N OF IS370	237,465	280,686	43,221	18%
11	IS270-.30 MI N OF SHADY GROVE RD	231,337	280,853	49,516	21%
12	IS270-.50 MI N OF MD28	247,714	293,859	46,146	19%
13	IS270-.30 MI S OF MD28	287,651	330,549	42,898	15%
14	IS270-.30 MI N OF MD927 (MONTROSE RD)	291,427	335,117	43,689	15%
15	IS270-.10 MI N OF TUCKERMAN LA	293,792	335,698	41,907	14%
16	IS270Y-.30 MI N OF WESTLAKE TERR	167,745	198,893	31,148	19%
17	IS270Y-.40 MI S OF DEMOCRACY BLVD	177,952	198,143	20,191	11%
18	IS270-.30 MI N OF MD187B	126,047	136,806	10,759	9%
19	IS270-.10 MI S OF MD187	105,487	114,495	9,008	9%

Table 3b. Simulated AAWDT Volumes on Capital Beltway; 2016 Validation vs. 2040 Alt 1/True No Build

Sequence	Location	2016	2040 Alt 1	Difference	% Diff.
1	IS495-.10 MI E OF PERSIMMON TREE RD	239,294	264,080	24,786	10%
2	IS495-.70 MI N OF MD190	317,153	344,957	27,804	9%
3	IS495-.50 MI W OF MD187	139,201	146,814	7,613	5%
4	IS495-.30 MI E OF MD187	134,833	142,380	7,547	6%
5	IS495-.20 MI E OF MD355	244,879	256,442	11,563	5%
6	IS495-.80 MI W OF MD97	242,329	250,875	8,545	4%
7	IS495-.20 MI E OF MD97	234,955	241,649	6,694	3%
8	IS495-.20 MI E OF US29	225,967	235,021	9,053	4%
9	IS 495 West of MD 650 (ATR#41)	237,779	253,528	15,749	7%
10	IS495-.10 MI W OF MD212	280,772	292,711	11,939	4%
11	IS95-.30 MI N OF US1	227,076	241,866	14,790	7%
12	IS95-.40 MI S OF US1	201,338	215,856	14,518	7%
13	IS95-.30 MI N OF MD201	191,155	204,455	13,300	7%
14	IS95-.30 MI S OF MD201	199,218	212,579	13,361	7%
15	IS 95 North of Good Luck Rd (ATR#55)	200,117	212,342	12,225	6%
16	IS95-.60 MI N OF IS595/US50	212,565	222,048	9,483	4%
17	IS95-.10 MI S OF MD704	224,762	240,128	15,367	7%
18	IS95-.40 MI S OF MD202	214,610	228,942	14,332	7%
19	IS 95 South of MD 214 (ATR#43)	194,646	214,922	20,276	10%
20	IS95-.50 MI N OF MD4	193,249	210,845	17,596	9%
21	IS95-.40 MI S OF MD4	176,319	200,506	24,187	14%
22	IS95-.40 MI N OF MD5	167,731	180,479	12,749	8%
23	IS 95 at Temple Hill Rd (ATR#49)	149,136	170,533	21,397	14%
24	IS95-.40 MI S OF MD414	148,784	172,622	23,837	16%
25	IS95-.30 MI S OF MD210	172,551	202,714	30,163	17%
26	IS95-.50 MI N OF VIRGINIA ST/L	222,444	254,592	32,149	14%

Table 3c. Simulated AAWDT Volumes on MD 295; 2016 Validation vs. 2040 Alt 1/True No Build

Sequence	Location	2016	2040 Alt 1	Difference	% Diff.
1	MD295-.10 MI S OF BALTIMORE CO/L	84,912	102,907	17,995	21%
2	MD295-.20 MI S OF IS695	73,695	82,356	8,661	12%
3	MD295-.60 MI N OF IS195	74,891	82,372	7,481	10%
4	MD295-.30 MI N OF MD100	92,585	106,492	13,907	15%
5	MD295-.60 MI S OF MD100	103,443	122,722	19,279	19%
6	MD295-.25 MI S OF MD175	107,288	119,185	11,897	11%
7	MD295-.50 MI S OF MD32	115,358	120,412	5,054	4%
8	MD295-.30 MI N OF MD197	95,239	108,596	13,357	14%
9	MD295-.60 MI S OF MD197	105,206	114,712	9,505	9%
10	MD295-.40 MI N OF MD193	91,028	97,096	6,069	7%
11	MD295-.30 MI N OF IS95	105,196	109,023	3,827	4%
12	MD295-.30 MI S OF IS95	88,878	96,911	8,034	9%
13	MD295-.20 MI N OF MD450	90,848	96,620	5,772	6%
14	MD295-.20 MI N OF MD202	101,312	109,058	7,746	8%
15	MD295-.50 MI N OF US50	101,045	111,094	10,049	10%

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Carole Delion, Lisa Shemer, Subrat Mahapatra, MD SHA, Kari Snyder, MDOT

FROM: Dusan Vuksan, Feng Xie, Yu Gao, TPB Staff

SUBJECT: Summary of Findings for the Traffic Relief Plan Study based on the Regional Travel Demand Modeling Process

DATE: August 16, 2018

CC: Tim Canan, Ron Milone, Anant Choudhary, TPB Staff

1. INTRODUCTION

The Maryland State Highway Administration (SHA) has requested Transportation Planning Board (TPB) staff assistance in preparing travel demand forecasts for different future alternatives and strategies for Maryland's Traffic Relief Plan Study (TRP). The study is assessing the impacts of addition of dynamically-priced electronic toll lanes (ETLs) on I-270, Capital Beltway (I-495) and MD-295. It is being led by SHA with consulting support from multiple firms. TPB staff work was funded by the Maryland portion of the state Technical Assistance Program within the Unified Planning Work Program (UPWP). This draft technical memorandum documents the work activity undertaken by TPB staff in support of the study during the fiscal year 2018 (July 1, 2017 through June 30, 2018).

The regional travel demand modeling documented in this memorandum is one of several steps in the evaluation of alternatives, and the data generated by TPB staff will be refined further using additional data sources and techniques (i.e., volume refinement, microsimulation, etc.). As such, this memorandum is not prescriptive and does not recommend any specific alternative(s).

MEMORANDUM STRUCTURE

The primary goal of the memorandum is to document the completed technical work by TPB staff for the first phase of the study in FY 2018.

This technical memorandum is arranged in three sections along with appendices:

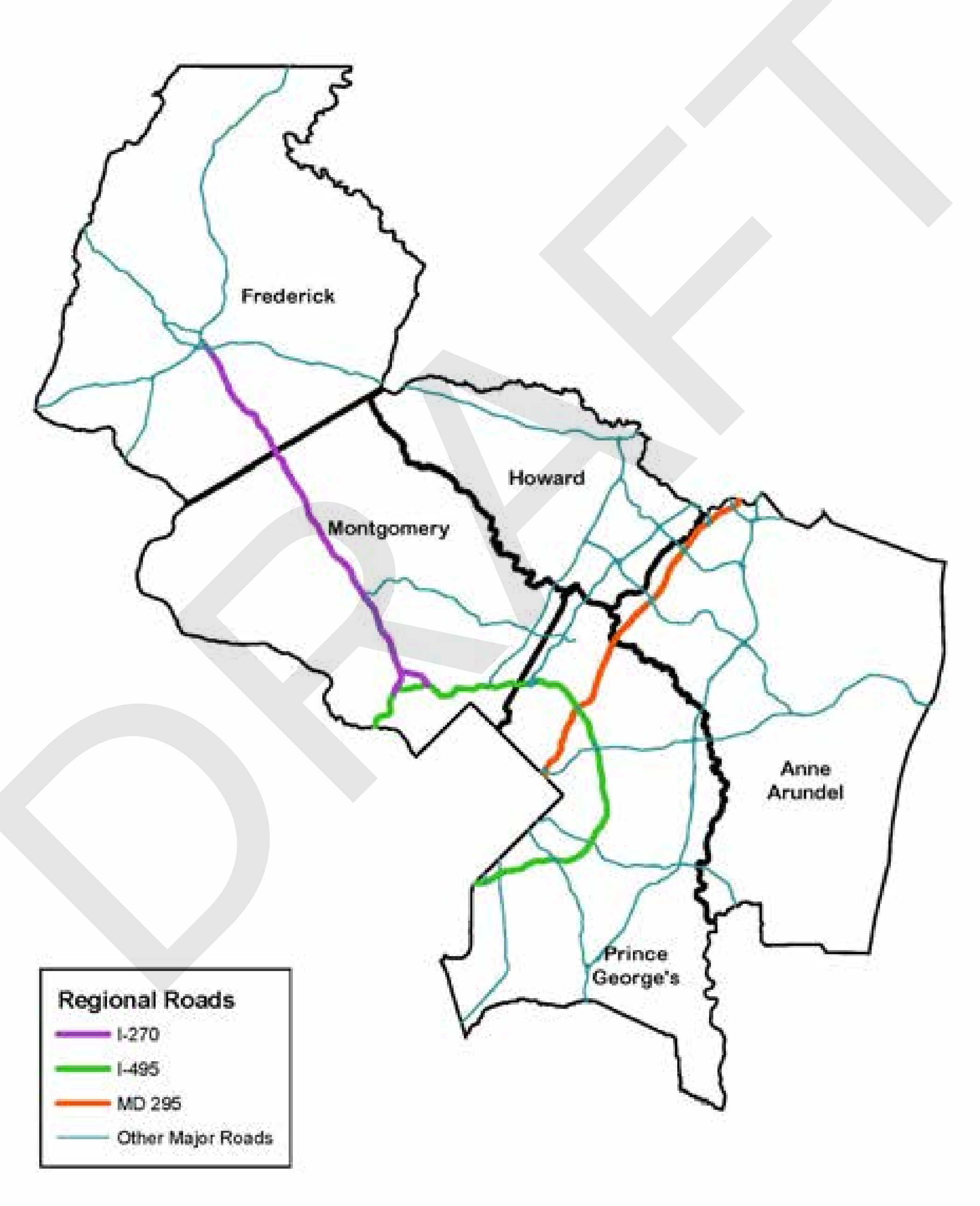
1. Introduction
2. Model Validation (2016)
3. Alternatives Assumptions and Analysis (2040)

Appendix A (Focused Study Area Summaries)
Appendix B (Detailed Screenline Summaries)

STUDY AREA DEFINITION

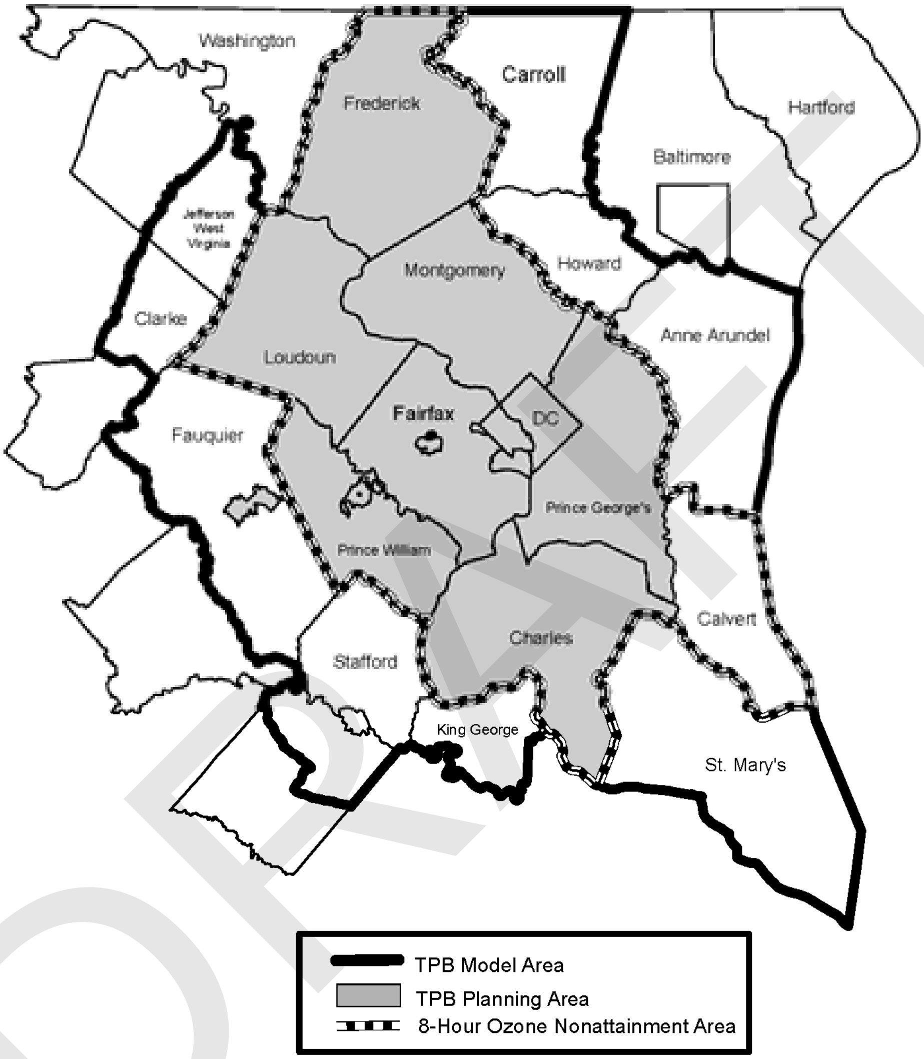
The geographic scope of the project is exceptionally large in relation to most project planning studies that are typically undertaken by TPB staff. It spans five of the major suburban Maryland jurisdictions, including Prince George's, Montgomery, Frederick, Anne Arundel and Howard counties (Map 1).

Map 1. Traffic Relief Plan Study Area



As a reference point, the TPB modeled area extends from West Virginia to the Chesapeake Bay, and from Pennsylvania to Spotsylvania County, Virginia (Map 2).

Map 2. TPB Modeled Area



Some of the analysis was also conducted using the three-county study area, or the "focused study area", which is limited to the pertinent TPB Planning Area jurisdictions impacted by at least one of the build alternatives. It therefore includes Montgomery, Prince George's and Frederick counties. The focused study area allows for additional examination of alternative-specific impacts for those alternatives that do not extend beyond the TPB Planning Area. The map of the "focused study area" and some of the trip-making statistics associated with it are included in Appendix A.

REGIONAL MODELING TOOLS AND METHODS

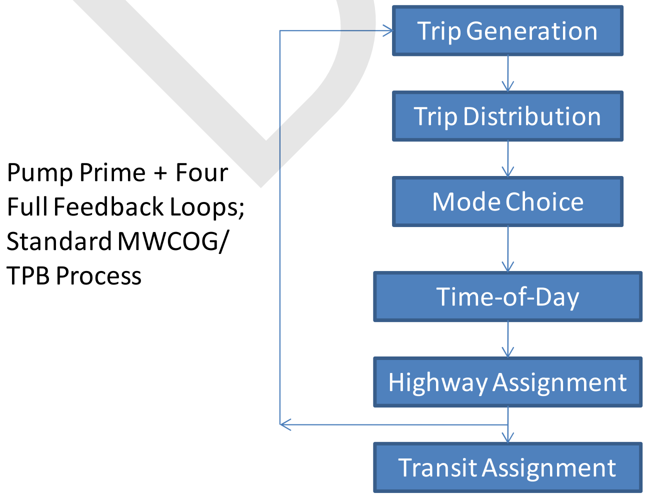
The TPB staff develops and maintains, with consultant assistance, a series of regional travel demand forecasting models that are used for the regional transportation planning process in the Washington, D.C. area. In this series of models, the most recent is the Version 2.3.70 travel demand model, which became official following TPB's approval of the planning assumptions and technical methods used to support the latest Air Quality Conformity (AQC) analysis on October 18, 2017 (also referred to as the Virginia Department of Transportation (VDOT) and the Maryland Department of Transportation (MDOT) off-cycle amendment to the 2016 Constrained Long-Range Plan).

Although Version 2.3.70 travel demand model is the official TPB "production model", it was only used as the starting point "base" model, but was subsequently revised to better represent dynamically-priced lanes that do not provide preferential treatment to high-occupancy vehicles (which are assumed in all build alternatives in this study). Essentially, to reflect this policy assumption, TPB staff removed the "HOV Skim Replacement" procedure from the modeling process, with the revised model no longer requiring the "base-run" modeling step for each analysis year. At the same time, the revised model still provides preferential treatment to the carpools on HOT lane facilities in Virginia, as HOV users of Virginia HOT lanes are able to access them free of charge. The resulting regional model used in preparation of the TRP model estimates by TPB staff for base-year validation and 2040 alternatives analysis is referred to as the Version 2.3.71 travel demand model.

The Version 2.3.71 travel demand model is therefore **not** an official model used in air quality conformity analysis, but it is a model that was specifically developed for modeling of the TRP alternatives. The new methods and features introduced in Version 2.3.71 are being incorporated into the next version of the official TPB model. Following the approval of TPB's current Long-Range Plan update called Visualize 2045 (scheduled for October 2018), an updated user's guide for the next official "conformity" model will be released.

Like its predecessors, the Version 2.3.71 model is a trip-based four step model with feedback loops to trip generation (Exhibit 1).

Exhibit 1. MWCOG / TPB Travel Demand Forecasting Process (Version 2.3.71)



The Version 2.3 model was initially calibrated and validated to the 2007 conditions using an array of survey data[1], including:

- 2007/2008 Household Travel Survey,
- On-board transit surveys for 2007 and 2008,
- 2007 Highway Performance Monitoring System (HPMS) traffic count data,
- 2007 Air Passenger Survey, and
- 2007 American Community Survey (ACS).

The Version 2.3 travel demand model was subsequently re-validated at the regional level to the 2010 conditions using the following data sources[2]:

- 2010 Census,
- 2010 American Community Survey (ACS),
- 2010/11 TPB Geographically Focused Household Travel Survey (HTS),
- 2010 Highway Performance Monitoring Survey (HMPS) data, and
- 2010 Metrorail fare-gate counts.

The Version 2.3.71 model used in this study was validated in the study area to the 2016 conditions. Model estimates are based on the Round 9.0 Cooperative Forecasts and 2016 Constrained Long-Range Plan (CLRP), with some minor network modifications discussed in subsequent sections. Consistent with the regionally adopted modeling process at the time the work was being performed, the Metrorail constraint for trips to and through the region's core is assumed to more accurately reflect the assumed Metrorail carrying capacity in the future.

Finally, as with other project planning studies conducted in the region, upon completion of regional model runs, SHA and study team consultants plan to post-process the data to arrive at final volume, turning movement and speed estimates, which will be described in forthcoming documentation.

2. MODEL VALIDATION (2016)

The regional TPB model is mainly calibrated and validated to regional targets. However, this level of validation is usually not sufficient for project planning studies, which typically require some level of subarea validation. This step is needed to be able to evaluate model estimation against observed data for specific study areas that are typically significantly smaller than the modeled region. Model validation findings also often lead to input adjustments to improve the model performance.

Model validation for the Traffic Relief Study was conducted for the analysis year 2016. Staff mainly focused on the highway validation in the study area and used aerial photography to add network detail, and to revise the facility type and number of lanes network representation, where necessary.

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[1] MWCOG/TPB, "Calibration Report for the TPB Travel Forecasting Model, Version 2.3, on the 3,722-Zone Area System: Final Report", January 20, 2012, "https://www.mwcog.org/assets/1/28/v2.3_calibration_report_v141.pdf"

[2] Ron Milone, "2010 Validation of the Version 2.3 Travel Demand Model", MWCOG/TPB Memorandum, June 30, 2013, "https://www.mwcog.org/assets/1/28/2010_Validation_Memo_v3.pdf"

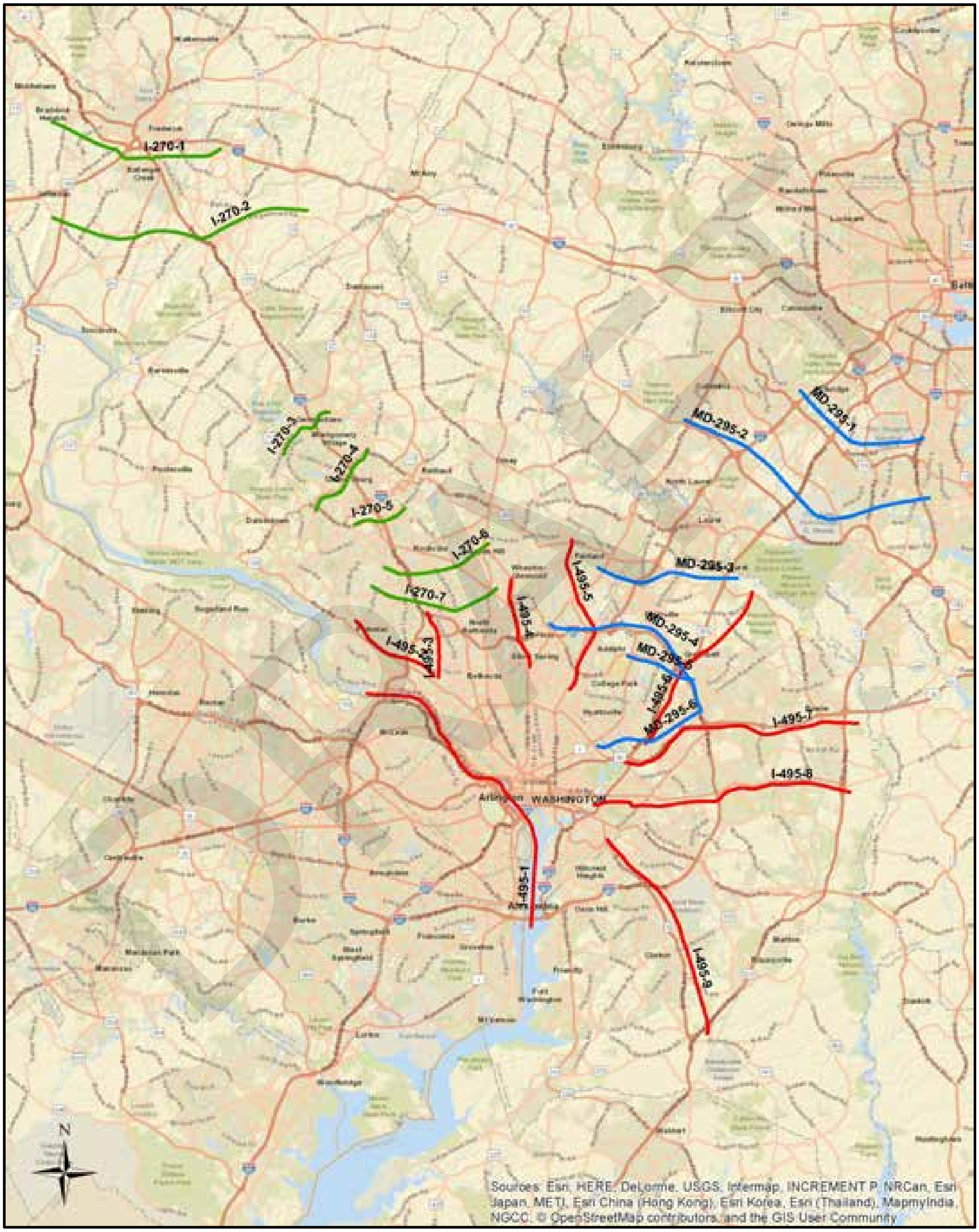
As 2040 alternatives did not contain any new transit service beyond what was already assumed in the CLRP, transit validation was not conducted for this study.

It is important to note that even with all of the implemented network refinements, modeling results are still based on a regional travel demand model, and that it is recommended that the model output be further post-processed and refined.

MODEL VALIDATION RESULTS

Screenline volume model output was the main source of data used to validate the model to observed counts in the study area. A map of screenlines specially formulated for this particular study effort is provided on the following page (Map 3). A summary of observed and estimated volume comparisons at the screenline level of analysis is shown in Table 1. The Average Annual Weekday Daily Traffic (AAWDT) counts / observed data represent the 2015 conditions, as they were the most recent observed data available for analysis when the study began. Furthermore, any differences between the 2015 and 2016 observed traffic counts were considered inconsequential by the project team.

Map 3. Screenlines for the Traffic Relief Plan



Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

Table 1. 2016 Validation: 2015 Observed versus 2016 Simulated AAWDT Volumes* by Screenline

Screenline ID	Location	Observed	Simulated	Difference	% Diff.
I-270-1	South of I-70	288,116	307,940	19,824	7%
I-270-2	North of Fingerboard Rd	138,134	184,326	46,192	33%
I-270-3	South of Germantown Rd	231,104	249,901	18,797	8%
I-270-4	South of Quince Orchard Rd	363,634	359,373	-4,261	-1%
I-270-5	South of I-370	338,752	342,027	3,275	1%
I-270-6	North of Montrose Rd	436,266	473,757	37,491	9%
I-270-7	North of the Spurs	425,466	475,267	49,801	12%
I-495-1	Potomac River	916,448	935,888	19,440	2%
I-495-2	North of River Rd	302,322	357,450	55,128	18%
I-495-3	Between the Spurs	294,286	319,958	25,672	9%
I-495-4	West of Georgia Ave	421,760	473,152	51,392	12%
I-495-5	East of New Hampshire Ave	485,514	550,779	65,265	13%
I-495-6	East of Baltimore Washington Pkwy	393,800	358,883	-34,917	-9%
I-495-7	South of US 50	612,422	546,973	-65,449	-11%
I-495-8	South of Central Ave	496,968	436,251	-60,717	-12%
I-495-9	East of Branch Ave	362,926	298,519	-64,407	-18%
MD-295-1	North of Dorsey Rd	507,576	567,461	59,885	12%
MD-295-2	North of Patuxent Pkwy	622,442	738,213	115,771	19%
MD-295-3	South of ICC	466,246	530,330	64,084	14%
MD-295-4	North of Capital Beltway	695,960	742,843	46,883	7%
MD-295-5	South of University Blvd	392,356	367,867	-24,489	-6%
MD-295-6	North of US 50	442,280	423,291	-18,989	-4%

Note: * Links with no count are excluded from screenline totals.

Table 1 shows that all of the estimated screenline volumes are within ±20% of the observed counts, with the exception of Screenline I-270-2 (at 33%). In addition, some of the estimated volumes for the Capital Beltway screenlines are close to the 20% margin (e.g., Screenline I-495-2), but these regional model findings are in line with the model validation for the Capital Beltway PEL Study conducted in 2016 and 2017[3]. This margin of error is quite reasonable given the coarseness of the regional network coding and the expected margin of error in the land activity inputs at the TAZ level. More detailed screenline and link-level summaries are shown in Appendix B.

3. ALTERNATIVES ASSUMPTIONS AND ANALYSIS (2040)

Based on the guidance received from MD SHA and the project team, TPB staff prepared preliminary forecasts for the assigned alternatives.

The following 2040 scenarios have been modeled and analyzed by TPB staff:

1. Alternative 1 ("True" No Build),
2. Alternative 2,
3. Alternative 3, and
4. Alternative 4.

ALTERNATIVE 1 / NO BUILD

The main purpose of Alternative 1 / No Build in the context of this analysis is to serve as a baseline for comparison of build alternatives – i.e., alternative-specific assumptions for each scenario were incorporated into No Build networks to arrive at build alternatives. Alternative 1 itself was evaluated against 2016 Validation to assess the magnitude of traffic growth in the study area.

The highway network refinements that were implemented in the Model Validation base year networks were carried forward to the 2040 Alternative 1 / No Build networks as well. They include:

- Review and revisions of the number of lanes on I-495, I-270 and MD-295
- Review and revisions of coding of interchanges with access to/from I-495, I-270 and MD-295
- Additional refinements in the Fort Meade area (existing NSA interchange added)
- Decrease in highway capacity on MD-295 (degraded from freeway to expressway)

Given the project schedule-related time constraints, the refinements do **not** include:

- Revisions in external trips, which would mainly impact MD-295 and I-270
- Zone splits and centroid connector revisions (except for the Fort Meade area)
- Detailed review and revisions of coding of intersecting facilities

In addition to the network revisions of the existing facilities noted above that were first implemented in model validation, <u>the following assumptions were used in Alternative 1 (also shown on Map 4):</u>

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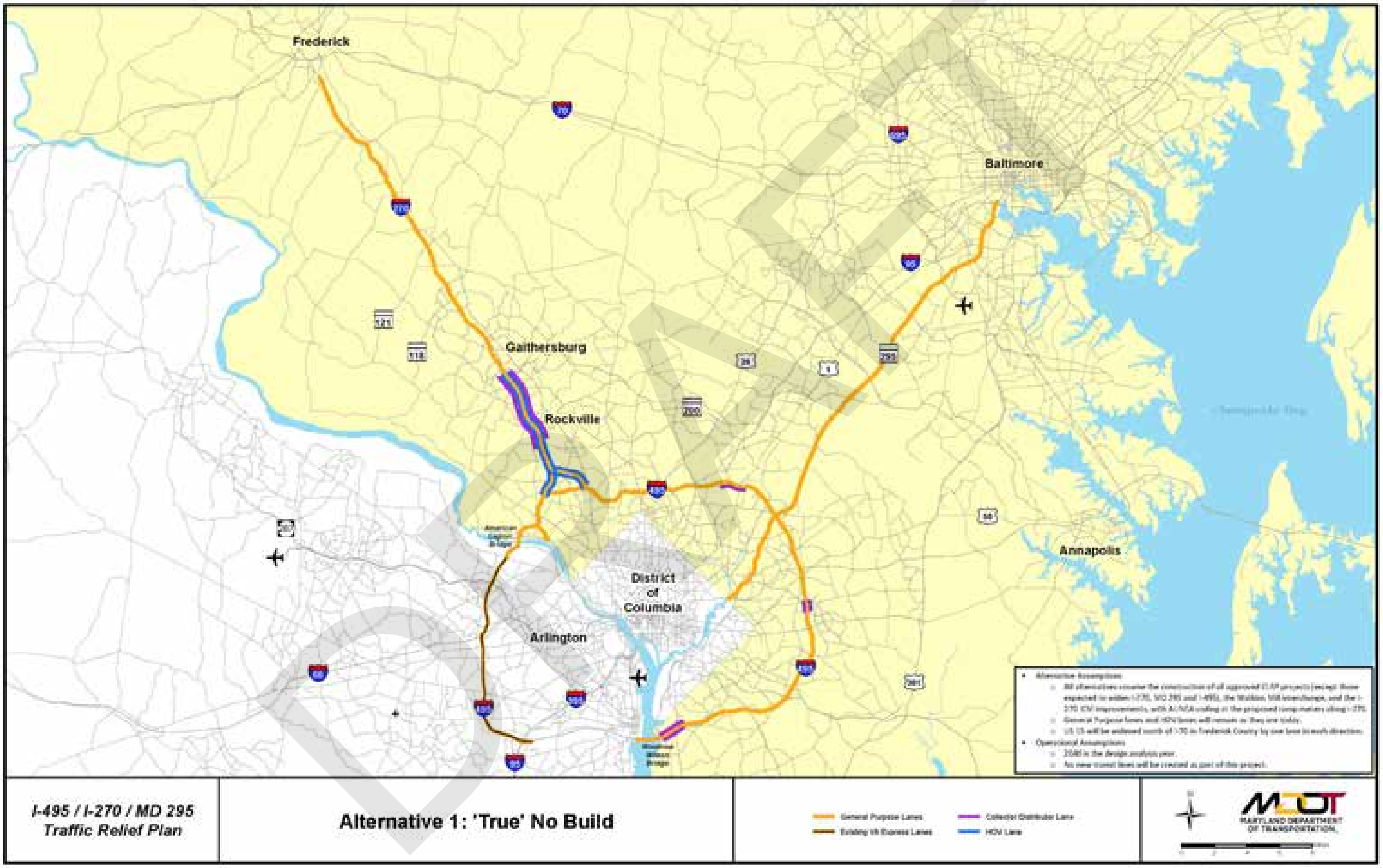
[3] Dusan Vuksan and Yu Gao, "Summary of Findings for the Capital Beltway Planning Study for FY 2017 based on the Regional Travel Demand Modeling Process", MWCOG/TPB Technical Memorandum, June 29, 2017

Map 4. Alternative 1 Lane Configuration



- CLRP projects on I-270, Capital Beltway in Maryland and MD-295 are **not** included, except for:
    - I-270 Innovative Congestion Management improvements (some of which result in additional capacity through implementation of auxiliary lanes)
    - Watkins Mill Road Interchange (I-270)
    - Corridor Cities Transitway (near I-270) and other transit projects in the corridor
    - Greenbelt Metro Station access improvement (I-495)
- Virginia HOT Lanes terminate just to the north of Dulles Toll Road (same as today)
    - However, CLRP projects on the Capital Beltway general purpose lanes (GPLs) between Dulles Toll Road and the American Legion Bridge are included (additional capacity via auxiliary lanes)
- CLRP assumptions are assumed elsewhere in the region, including some of the roadways intersecting the three TRP facilities (e.g., US 15, I-70, etc.)
- Consistent with today's operations, trucks are not allowed on MD-295 south of MD-175 and Capital Beltway HOT lanes in Virginia

Table 2 shows differences between 2040 Alternative 1 and 2016 Model Validation estimated volumes at the screenline level (Map 3). Generally, more significant traffic volume growth (greater than 15%) can be observed in the areas of Maryland that are currently less developed and farther removed from the urban core (i.e., with more room for growth in the future). At the same time, lower volume growth between now and 2040 can be observed on the screenlines that encompass the more developed areas around the Beltway, including Bethesda, Silver Spring, Wheaton, College Park and New Carrollton (less than 10%). The screenline traffic volume growth is also influenced by any highway and transit capacity expansion on the screenline facilities (as assumed in the CLRP), and by addition of new projects that are in close proximity to the screenlines.

Table 2. 2016 Validation versus 2040 Alternative 1/True No Build Simulated AAWDT Volumes* by Screenline

Screenline ID	Location	2016	2040 Alt. 1	Difference	% Diff.
I-270-1	South of I-70	308,868	389,806	80,938	26%
I-270-2	North of Fingerboard Rd	207,178	247,339	40,161	19%
I-270-3	South of Germantown Rd	249,901	270,202	20,301	8%
I-270-4	South of Quince Orchard Rd	363,164	427,742	64,578	18%
I-270-5	South of I-370	363,635	423,624	59,989	16%
I-270-6	North of Montrose Rd	530,793	588,394	57,601	11%
I-270-7	North of the Spurs	535,025	604,483	69,458	13%
I-495-1	Potomac River	935,888	1,054,571	118,683	13%
I-495-2	North of River Rd	378,771	417,362	38,591	10%
I-495-3	Between the Spurs	348,761	376,816	28,055	8%
I-495-4	West of Georgia Ave	502,311	538,443	36,132	7%
I-495-5	East of New Hampshire Ave	620,271	671,641	51,370	8%
I-495-6	East of Baltimore Washington Pkwy	411,210	448,946	37,736	9%
I-495-7	South of US 50	594,225	660,440	66,215	11%
I-495-8	South of Central Ave	557,193	614,266	57,073	10%
I-495-9	East of Branch Ave	326,756	379,544	52,788	16%
MD-295-1	North of Dorsey Rd	567,461	645,621	78,160	14%
MD-295-2	North of Patuxent Pkwy	806,565	921,108	114,543	14%
MD-295-3	South of ICC	581,458	651,186	69,728	12%
MD-295-4	North of Capital Beltway	778,382	842,627	64,245	8%
MD-295-5	South of University Blvd	367,867	395,368	27,501	7%
MD-295-6	North of US 50	453,955	483,122	29,167	6%

Note: * All links on the screenlines are included.

ALTERNATIVE 2

Alternative 2 provides two dynamically-priced express toll lanes (ETLs) on the Capital Beltway and I-270 south of I-370.

In addition to the network revisions of the existing facilities and specific assumptions related to the CLRP projects discussed in Model Validation and Alternative 1 sections of this memorandum, Alternative 2 assumptions in relation to Alternative 1 (No Build) are provided below and on Map 5[4]:

- Two additional dynamically-priced lanes are added to Capital Beltway in Maryland (in each direction)
- One additional dynamically-priced lane is added and one HOV lane is converted to a dynamically-priced lane on I-270 and I-270 Spurs between I-495 and I-370 (in each direction)
- Dynamically-priced express toll lanes on I-270 and Capital Beltway in Maryland will operate 24 hours in all directions
- Two Virginia HOT Lanes are added between the current terminus of HOT lanes and the American Legion Bridge (in each direction)
- Direct access interchanges and slip ramps between general purpose lanes and electronic toll lanes are added at specific locations on I-270 and Capital Beltway (as shown on Map 5)
- All toll lane users pay toll in Maryland, while 3+ person carpools do not pay to use the HOT lanes in Virginia
- Trucks are allowed to use electronic toll lanes on I-270 and Capital Beltway in Maryland
- Consistent with today's operations, trucks are not allowed on MD-295 south of MD-175 and on Virginia HOT lanes

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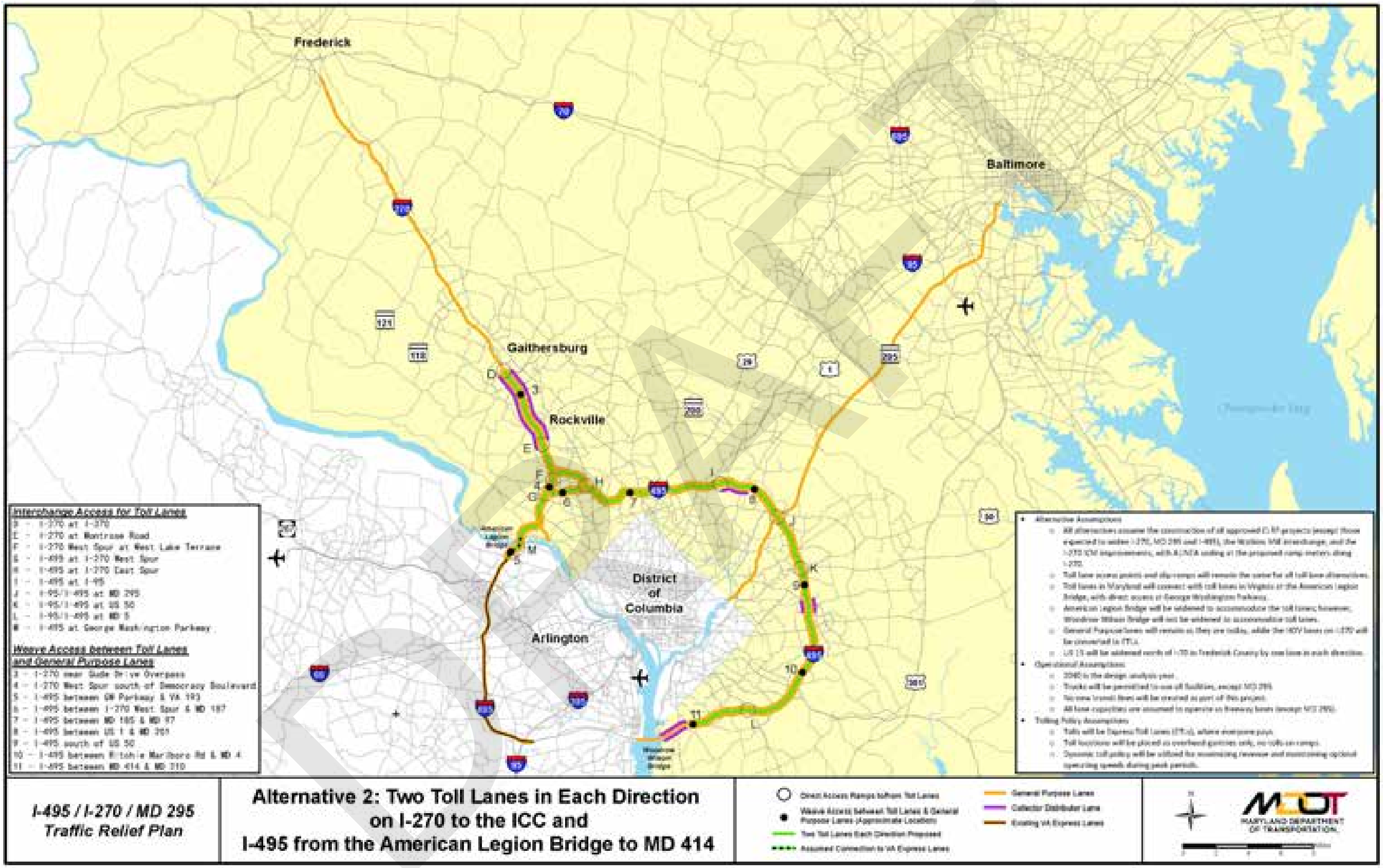
[4] The alternative layout maps that are included throughout this memorandum were created by MDOT when the study began. Some of the assumptions have since evolved (e.g., truck use on Baltimore-Washington Parkway in Alternative 4), but the maps have not been updated. Therefore, the maps should be used as a general guide for layout of individual alternatives. The specific assumptions for each alternative are listed in the corresponding section of the memorandum.

Map 5. Alternative 2 Lane Configuration



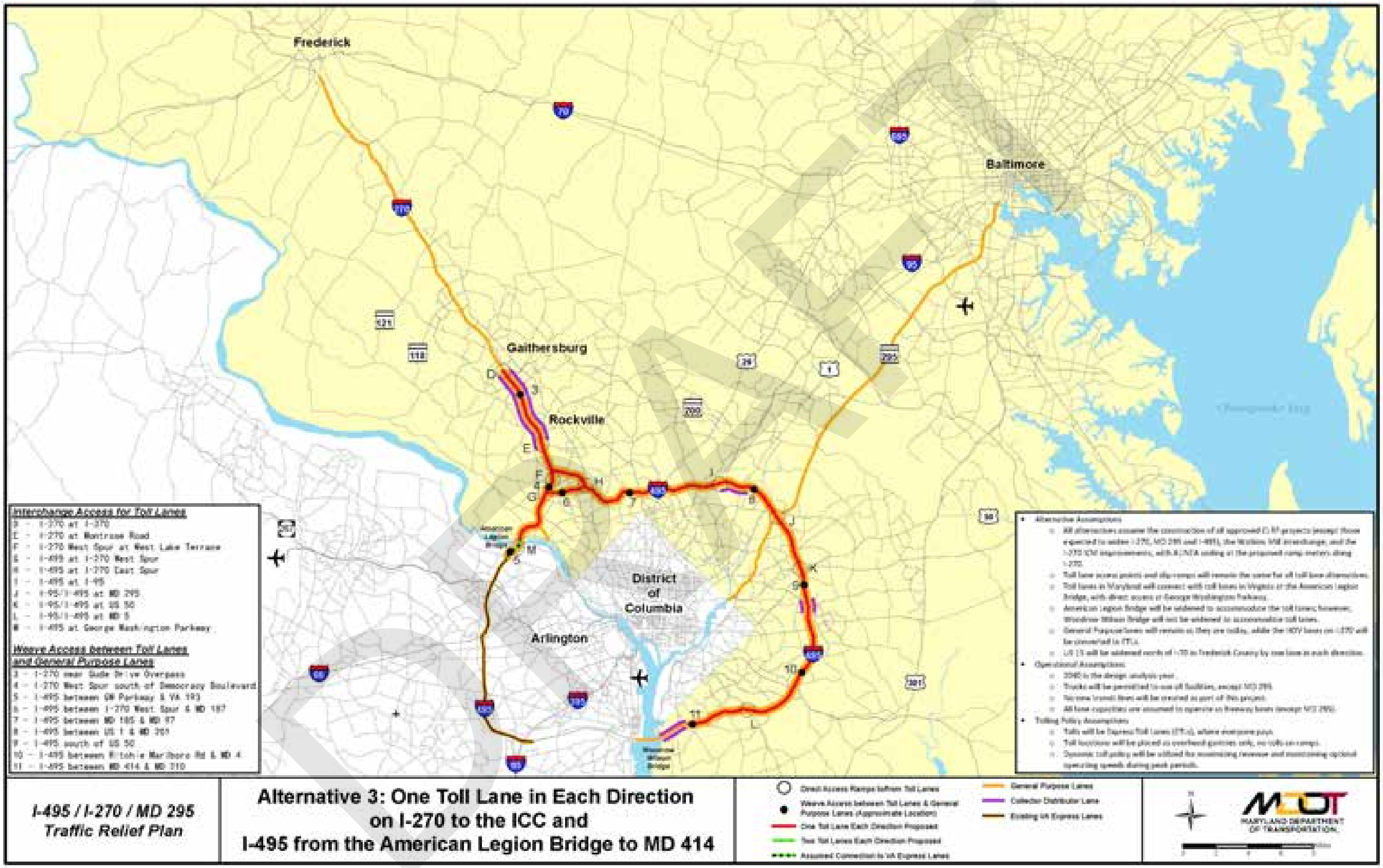
ALTERNATIVE 3

Alternative 3 provides one dynamically-priced express toll lane on the Capital Beltway and I-270 south of I-370.

In addition to the network revisions of the existing facilities and specific assumptions related to the CLRP projects discussed in Model Validation and Alternative 1 sections of this memorandum, Alternative 3 assumptions in relation to Alternative 1 (No Build) are provided below and on Map 6:

- One additional dynamically-priced lane is added to Capital Beltway in Maryland (in each direction)
- One HOV lane is converted to a dynamically-priced lane on I-270 and I-270 Spurs between I-495 and I-370 (in each direction)
- Dynamically-priced express toll lanes on I-270 and Capital Beltway in Maryland will operate 24 hours in all directions
- Two Virginia HOT Lanes are added between the current terminus of HOT lanes and the American Legion Bridge (in each direction)
- Direct access interchanges and slip ramps between general purpose lanes and electronic toll lanes are added at specific locations on I-270 and Capital Beltway (as shown on Map 6)
- All toll lane users pay toll in Maryland, while 3+ person carpools do not pay to use the HOT lanes in Virginia
- Trucks are allowed to use electronic toll lanes on I-270 and Capital Beltway in Maryland
- Consistent with today's operations, trucks are not allowed on MD-295 south of MD-175 and on Virginia HOT lanes

Map 6. Alternative 3 Lane Configuration



ALTERNATIVE 4

Alternative 4 provides two dynamically-priced express toll lanes (ETLs) on the Capital Beltway, I-270 south of MD-85, and on MD-295 between the Baltimore Beltway and US 50.

In addition to the network revisions of the existing facilities and specific assumptions related to the CLRP projects discussed in Model Validation and Alternative 1 sections of this memorandum, Alternative 4 assumptions in relation to Alternative 1 (No Build) are provided below and on Map 7:

- Two additional dynamically-priced lanes are added to Capital Beltway in Maryland (in each direction)
- One additional dynamically-priced lane is added and one HOV lane is converted to a dynamically-priced lane on I-270 and I-270 Spurs between I-495 and I-370 (in each direction)
- Two additional dynamically-priced lanes are added on I-270 between I-370 and MD 85 (in each direction)[5]
- Two additional dynamically-priced lanes are added on MD-295 between I-695 and US 50 (in each direction)
- Dynamically-priced express toll lanes on I-270, Capital Beltway and MD-295 in Maryland will operate 24 hours in all directions
- Two Virginia HOT Lanes are added between the current terminus of HOT lanes and the American Legion Bridge (in each direction)
- Direct access interchanges and slip ramps between general purpose lanes and electronic toll lanes are added at specific locations on I-270, Capital Beltway and MD-295 (as shown on Map 7)
- All toll lane users pay toll in Maryland, while 3+ person carpools do not pay to use the HOT lanes in Virginia
- Trucks are allowed to use electronic toll lanes on I-270, Capital Beltway, and both the electronic toll lanes and general purpose lanes on MD-295 in Maryland
- Consistent with today's operations, trucks are not allowed on Virginia HOT lanes

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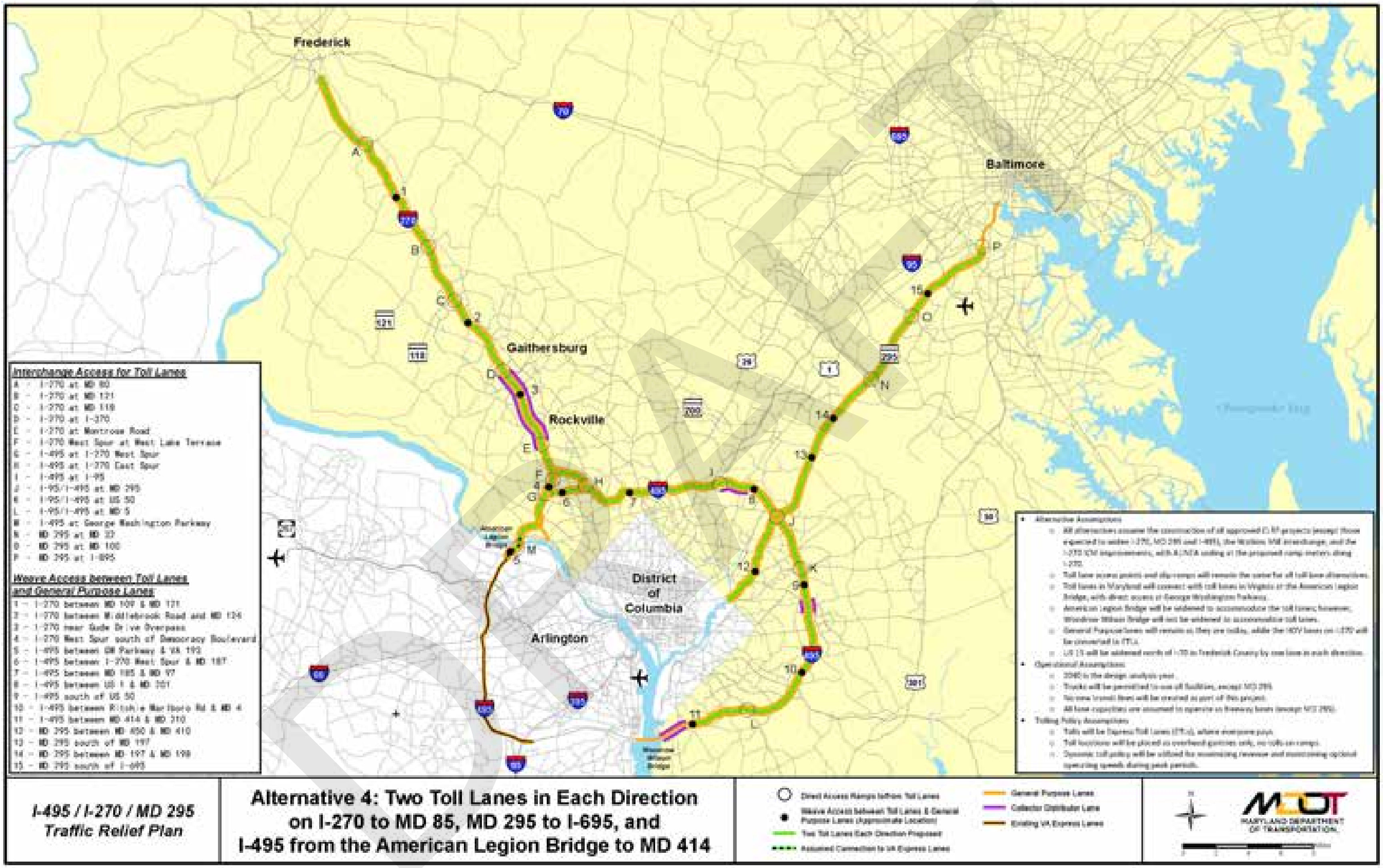
[5] The HOV lane currently extends between I-370 and MD-121 in the northbound direction only. In this section of I-270, the HOV lane is converted to a managed lane, and one additional managed lane is added.

Map 7. Alternative 4 Lane Configuration



Interchange Access for Toll Lanes
A - I-270 at MD 80
B - I-270 at MD 121
C - I-270 at MD 118
D - I-270 at I-370
E - I-270 at Montrose Road
F - I-270 West Spur at West Lake Terrace
G - I-495 at I-270 West Spur
H - I-495 at I-270 East Spur
I - I-495 at I-95
J - I-95/I-495 at MD 295
K - I-95/I-495 at US 50
L - I-95/I-495 at MD 5
M - I-495 at George Washington Parkway
N - MD 295 at MD 32
O - MD 295 at MD 100
P - MD 295 at I-695

Weave Access between Toll Lanes and General Purpose Lanes
1 - I-270 between MD 109 & MD 121
2 - I-270 between Middlebrook Road and MD 124
3 - I-270 near Gude Drive Overpass
4 - I-270 West Spur south of Democracy Boulevard
5 - I-495 between GW Parkway & VA 193
6 - I-495 between I-270 West Spur & MD 187
7 - I-495 between MD 185 & MD 97
8 - I-495 between US 1 & MD 201
9 - I-495 south of US 50
10 - I-495 between Ritchie Marlboro Rd & MD 4
11 - I-495 between MD 414 & MD 210
12 - MD 295 between MD 450 & MD 410
13 - MD 295 south of MD 197
14 - MD 295 between MD 197 & MD 198
15 - MD 295 south of I-695

- Alternative Assumptions
    - All alternatives assume the construction of all approved CLRP projects (except those expected to widen I-270, MD 295 and I-495), the Watkins Mill interchange, and the I-270 ICM improvements, with ALINEA coding at the proposed ramp meters along I-270.
    - Toll lane access points and slip ramps will remain the same for all toll lane alternatives.
    - Toll lanes in Maryland will connect with toll lanes in Virginia at the American Legion Bridge, with direct access at George Washington Parkway.
    - American Legion Bridge will be widened to accommodate the toll lanes; however, Woodrow Wilson Bridge will not be widened to accommodate toll lanes.
    - General Purpose lanes will remain as they are today, while the HOV lanes on I-270 will be converted to ETLs.
    - US 15 will be widened north of I-70 in Frederick County by one lane in each direction.
- Operational Assumptions
    - 2040 is the design analysis year.
    - Trucks will be permitted to use all facilities, except MD 295.
    - No new transit lines will be created as part of this project.
    - All lane capacities are assumed to operate as freeway lanes (except MD 295).
- Tolling Policy Assumptions
    - Tolls will be Express Toll Lanes (ETLs), where everyone pays.
    - Toll locations will be placed as overhead gantries only, no tolls on ramps.
    - Dynamic toll policy will be utilized for maximizing revenue and maintaining optimal operating speeds during peak periods.

I-495 / I-270 / MD 295
Traffic Relief Plan

Alternative 4: Two Toll Lanes in Each Direction on I-270 to MD 85, MD 295 to I-695, and I-495 from the American Legion Bridge to MD 414

○ Direct Access Ramps to/from Toll Lanes
● Weave Access between Toll Lanes & General Purpose Lanes (Approximate Location)
🟩 Two Toll Lanes Each Direction Proposed
- - - Assumed Connection to VA Express Lanes
🟧 General Purpose Lanes
🟪 Collector Distributor Lane
🟫 Existing VA Express Lanes

MDOT
MARYLAND DEPARTMENT OF TRANSPORTATION

ALTERNATIVES ANALYSIS BASED ON REGIONAL MODEL OUTPUT

The data generated by the regional model, such as traffic volume and speed estimates, will be superseded with study area-focused analysis that includes post-processing of volumes and traffic microsimulation. However, summaries and comparisons of findings created by the TPB modeling process are useful for quality assurance purposes and in providing general high-level trends related to the modeled alternatives. TPB staff has evaluated and reviewed screenline volumes, VMT and vehicle hours of delay in the study area, reliability and tolls.

TRAFFIC VOLUME ANALYSIS

With respect to average weekday daily vehicle volumes on the screenlines, build alternatives carry up to 15% more vehicles than No Build (Table 3) at selected locations. Alternative 3 shows the most modest changes in volumes, as I-270 assumptions for this alternative assume no new freeway capacity, but a managed lane conversion from HOV to ETL. Additional detailed screenline summaries, previously transmitted to SHA, are shown in Appendix B.

Table 3a. 2040 No Build versus Build Alternatives; Simulated AAWDT Volumes* by Screenline

Screenline ID	Location	Alternative 1	Alternative 2	Alternative 3	Alternative 4
I-270-1	South of I-70	389,806	390,599	389,881	406,676
I-270-2	North of Fingerboard Rd	247,339	247,849	247,183	267,505
I-270-3	South of Germantown Rd	270,202	270,608	269,879	286,604
I-270-4	South of Quince Orchard Rd	427,742	427,549	425,688	439,835
I-270-5	South of I-370	423,624	430,071	418,117	430,972
I-270-6	North of Montrose Rd	588,394	589,498	577,086	588,655
I-270-7	North of the Spurs	604,483	608,216	593,208	607,807
I-495-1	Potomac River	1,054,571	1,080,947	1,075,592	1,084,039
I-495-2	North of River Rd	417,362	455,235	436,491	459,590
I-495-3	Between the Spurs	376,816	426,861	406,475	431,850
I-495-4	West of Georgia Ave	538,443	598,166	572,540	603,746
I-495-5	East of New Hampshire Ave	671,641	714,351	698,271	720,898
I-495-6	East of Baltimore Washington Pkwy	448,946	467,147	461,854	466,943
I-495-7	South of US 50	660,440	672,793	668,675	676,407
I-495-8	South of Central Ave	614,266	623,414	621,688	624,279
I-495-9	East of Branch Ave	379,544	387,415	386,122	387,694
MD-295-1	North of Dorsey Rd	645,621	646,630	646,202	664,135
MD-295-2	North of Patuxent Pkwy	921,108	921,840	921,324	943,408
MD-295-3	South of ICC	651,186	657,814	658,978	698,029
MD-295-4	North of Capital Beltway	842,627	858,680	857,276	885,880
MD-295-5	South of University Blvd	395,368	414,662	408,211	446,117
MD-295-6	North of US 50	483,122	496,917	492,032	512,887

Note: * All links on the screenlines are included.

Table 3b. 2040 No Build versus Build Alternatives; Percent Differences in Simulated AAWDT Volumes* by Screenline Relative to No Build

Screenline ID	Location	Alternative 1	Alternative 2	Alternative 3	Alternative 4
I-270-1	South of I-70	N/A	0%	0%	4%
I-270-2	North of Fingerboard Rd	N/A	0%	0%	8%
I-270-3	South of Germantown Rd	N/A	0%	0%	6%
I-270-4	South of Quince Orchard Rd	N/A	0%	0%	3%
I-270-5	South of I-370	N/A	2%	-1%	2%
I-270-6	North of Montrose Rd	N/A	0%	-2%	0%
I-270-7	North of the Spurs	N/A	1%	-2%	1%
I-495-1	Potomac River	N/A	3%	2%	3%
I-495-2	North of River Rd	N/A	9%	5%	10%
I-495-3	Between the Spurs	N/A	13%	8%	15%
I-495-4	West of Georgia Ave	N/A	11%	6%	12%
I-495-5	East of New Hampshire Ave	N/A	6%	4%	7%
I-495-6	East of Baltimore Washington Pkwy	N/A	4%	3%	4%
I-495-7	South of US 50	N/A	2%	1%	2%
I-495-8	South of Central Ave	N/A	1%	1%	2%
I-495-9	East of Branch Ave	N/A	2%	2%	2%
MD-295-1	North of Dorsey Rd	N/A	0%	0%	3%
MD-295-2	North of Patuxent Pkwy	N/A	0%	0%	2%
MD-295-3	South of ICC	N/A	1%	1%	7%
MD-295-4	North of Capital Beltway	N/A	2%	2%	5%
MD-295-5	South of University Blvd	N/A	5%	3%	13%
MD-295-6	North of US 50	N/A	3%	2%	6%

Note: * All links on the screenlines are included.

VEHICLE MILES TRAVELED AND VEHICLE HOURS OF DELAY

Vehicle miles traveled (VMT) and vehicle hours of delay (VHD) in the study area are useful measures in assessing how alternatives perform with respect to congestion. Table 4 indicates that each build alternative carries more vehicles but is less congested than Alternative 1 (No Build) in the study area (Map 1). With respect to relative assessment of alternatives against one another, it is important to note that finding a “perfect geography” to capture the full impact of alternative-specific inputs on delay for these types of scenarios can be challenging. With that in mind, the analysis shows that the alternatives with more significant expansion of the ETL system (i.e., Alternative 4 and Alternative 2) show the most significant increase in VMT and decrease in vehicle hours of delay for the study area.

Table 4a. Simulated Daily Vehicle Miles of Travel (VMT) and Vehicle Hours of Delay (VHD) in Study Area for 2040 Alternatives

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
VMT	95,187,180	96,009,424	95,688,684	96,627,050
VHD	1,644,916	1,577,494	1,612,378	1,326,958

Table 4b. Simulated Daily Vehicle Miles of Travel (VMT) and Vehicle Hours of Delay (VHD) in Study Area; % Differences Relative to Alternative 1 (No Build)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
VMT	N/A	0.9%	0.5%	1.5%
VHD	N/A	-4.1%	-2.0%	-19.3%

PERSON MILES TRAVELED ON RELIABLE ROADWAYS

Table 5 provides comparisons of highway user reliability, using a newly developed measure that calculates percentages of person miles traveled on “reliable” roadways. For the purposes of this calculation, “reliable” roadways include HOV and express toll lanes (e.g., HOT lanes in Virginia, ETLs in Maryland, and ICC are all included, but general purpose lanes on Dulles Toll Road are not). The data show that the percentage of travel on reliable roadways is greatest in Alternative 4 due to the significant addition of dynamically-priced lanes throughout Maryland.

Table 5. Daily Auto Person Miles of Travel (PMT) on Reliable Roadways in Study Area for 2040 Alternatives

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
PMT by Auto	128,237,781	129,532,562	129,085,743	131,320,994
PMT by Auto on Reliable Roadways	2,836,840	6,095,845	5,054,562	10,402,530
% Auto PMT on Reliable Roadways	2.2%	4.7%	3.9%	7.9%

TOLL RATES

The planning-level dynamic tolls were developed by TPB staff using an iterative off-line process designed to estimate toll values that ensure free flow (or near free flow) operating conditions on all tolled segments[6]. Table 6 examines the end-to-end tolls and toll rates for specific roadway segments in AM peak period. It shows that in the peak direction, some of the toll rates are high, at well over $2 per mile. The high toll rate segments include I-270 north of I-370 and MD-295 north of the Beltway, both in Alternative 4. In each case, the toll rates on these segments are high because substantial demand exists in these areas, as indicated by the very high volume-to-capacity ratios on the adjacent GPLs in Alternative 4 and in No Build. Given the high demand, travelers would need to pay more to attain free flow conditions on the dynamically-priced toll lanes (i.e., conversely, if there were low vehicle-to-capacity ratios and no congestion on GPLs, one could argue that ETLs would not be needed).

Table 6. AM Peak Period Toll Rates for 2040 Build Alternatives (in 2016 Dollars per Mile)

Segment	Distance (mile)	Alt. 2	Alt. 3	Alt. 4
Beltway				
VA HOT Lane Northern Terminus to American Legion Bridge*	2.19	1.10	0.74	0.94
American Legion Bridge to VA HOT Lane Northern Terminus*	2.19	1.36	0.54	1.31
American Legion Bridge to I-95	15.18	0.25	0.51	0.20
I-95 to American Legion Bridge	14.94	1.12	1.66	1.09
I-95 to Woodrow Wilson Bridge	24.04	0.20	0.22	0.20
Woodrow Wilson Bridge to I-95	24.37	0.24	0.31	0.24
I-270				
East Spur to I-370	9.71	0.20	0.20	0.20
I-370 to West Spur	9.24	0.87	1.42	1.12
I-370 to MD 85	21.99	N/A	N/A	0.20
MD 85 to I-370	21.96	N/A	N/A	2.26
MD 295				
US 50 to I-495	5.32	N/A	N/A	0.20
I-495 to US 50	5.54	N/A	N/A	0.20
I-495 to I-695	21.46	N/A	N/A	0.20
I-695 to I-495	21.37	N/A	N/A	2.77

Note: * Segment of Virginia HOT lanes

In the case of I-270 north of I-370, high toll rates are a reflection of relatively few alternative routes that are available to the travelers on the I-270 segments with two general purpose lanes. In the case of MD-295, volume-to-capacity ratios are high due to high demand and lower carrying capacity of both general purpose lanes and ETLs.

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[6] Near free flow conditions defined as vehicle-to-capacity ratio of less than one.

Toll rates in other alternatives are lower, although they are still high in selected locations on the Beltway and I-270 (on Capital Beltway near American Legion Bridge and on I-270 south of I-370).

While these modeled toll rates have not been specifically validated and are not considered "investment-grade" forecasts, they are generally a good indicator of location of future bottlenecks where users may have to pay high tolls to keep the traffic moving at or near free flow speeds. It is important to note that some of the toll rates could potentially change if they were estimated following the base year and future year volume refinement (consistent with post-processing methods outlined in NCHRP 765).

GENERAL OBSERVATIONS

Although the information from the regional travel demand model documented in this memorandum will be further refined, certain general findings in regard to the performance of alternatives based on the regional travel demand model are noted below. The observations and analysis do not include any assessments of other important factors that are typically considered in project planning, such as cost-effectiveness, safety and environmental impact, among others.

- Alternative 4, with two ETLs in each direction on all three facilities, shows greatest increase in vehicle miles traveled and decrease in vehicle hours of delay (Table 4).
- Each alternative improves system-wide reliability relative to Alternative 1 (No Build), with Alternative 4 having the largest percentage of auto person miles of travel on reliable roadways (Table 5).
- Estimated toll rates vary, but they are high on certain segments reaching over $2 per mile (Table 6). While TPB's travel forecasting model does not provide "investment-grade" toll forecasts, these findings can indicate that some of the tolls may be relatively high (perhaps similar to what has been observed on the Virginia HOT lanes).
- The analysis shows that dynamically-priced electronic toll lanes will be used extensively in certain sections, with average annual weekday volumes for ETLs surpassing 70,000 (these are "raw" regional model volumes that will be refined further). However, it is important to keep in mind that additional post-processing may be needed regarding the sub-allocation of daily volumes to specific user classes (trucks, single drivers, carpools, etc.) and to specific time-of-day periods (AM peak, Mid-day, PM peak, Night).

NEXT STEPS

TPB staff looks forward to assisting SHA with participating in regional modeling related to future project planning efforts.

APPENDIX A

FOCUSED STUDY AREA SUMMARIES

APPENDIX A. SUMMARY STATISTICS FOR FOCUSED STUDY AREA

Map A1. Traffic Relief Plan Focused Study Area

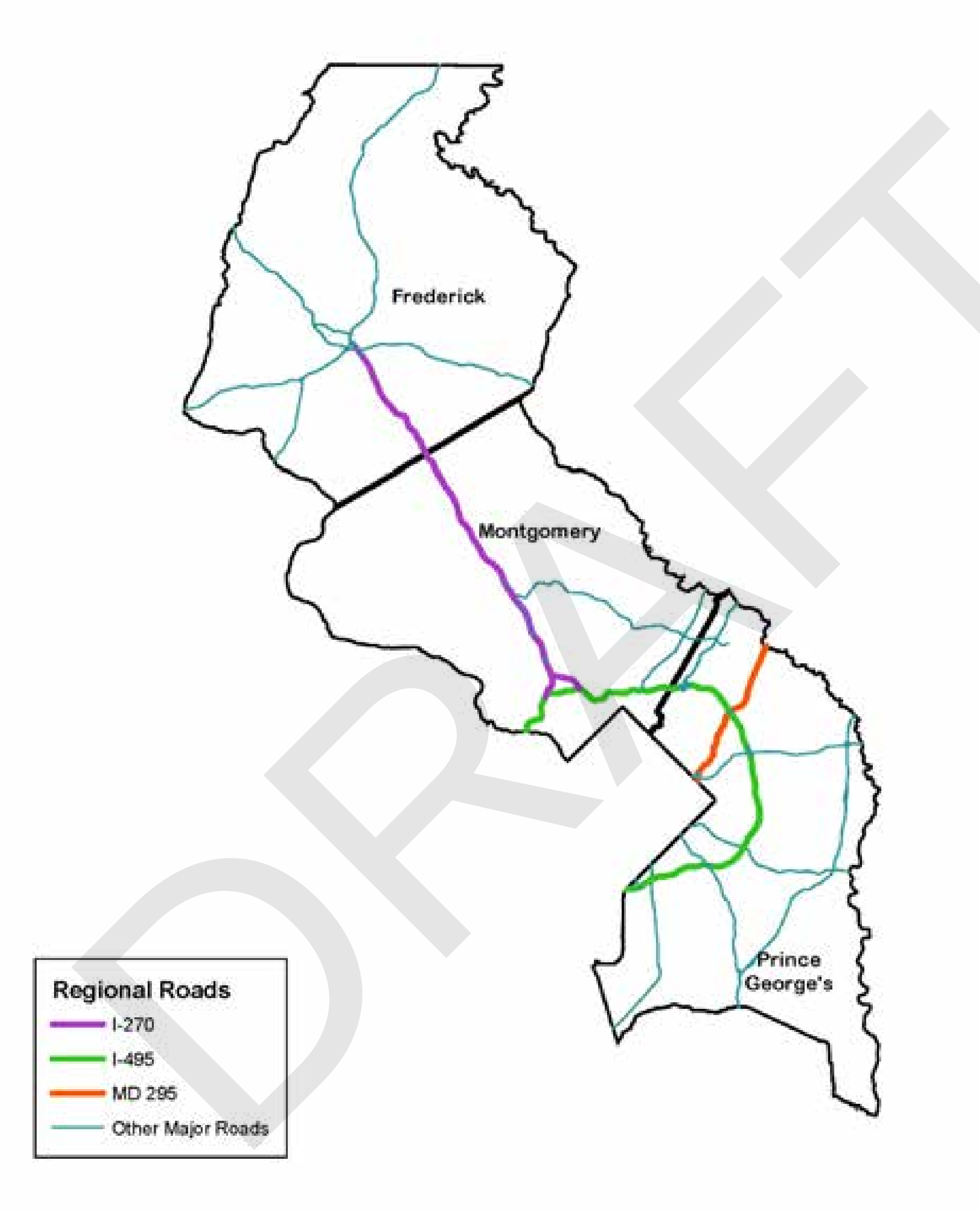

Table A1. Simulated Daily Vehicle Miles of Travel (VMT) and Vehicle Hours of Delay (VHD) in Focused Study Area for 2040 Alternatives

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
VMT	63,647,743	64,510,582	64,158,315	65,005,958
VHD	902,569	833,028	867,272	713,887

Table A2. Simulated Daily Vehicle Miles of Travel (VMT) and Vehicle Hours of Delay (VHD) in Focused Study Area; % Differences Relative to Alternative 1 (No Build)

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
VMT	N/A	1.4%	0.8%	2.1%
VHD	N/A	-7.7%	-3.9%	-20.9%

Table A3. Daily Auto Person Miles of Travel (PMT) on Reliable Roadways in Focused Study Area for 2040 Alternatives

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
PMT by Auto	85,847,637	87,229,021	86,715,055	88,799,672
PMT by Auto on Reliable Roadways	2,766,981	6,025,924	4,984,627	8,979,939
% Auto PMT on Reliable Roadways	3.2%	6.9%	5.7%	10.1%

APPENDIX B

DETAILED SCREENLINE SUMMARIES

APPENDIX B. DETAILED VOLUME SUMMARIES OF SCREENLINE FACILITIES AND I-270 / I-495 / MD 295 FACILITIES

Table B1. 2016 Validation: 2015 Observed vs. 2016 Simulated AAWDT Volumes by Facility for I-270 / I-495 / MD 295 Screenlines

Screenline I-270-1

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Jefferson Blvd	1,520	924	-596	-39%
2	Old Swimming Pool Rd	N/A	928	N/A	N/A
3	Jefferson Pike	3,840	3,284	-556	-14%
4	US-15	62,870	91,962	29,092	46%
5	Balenger Creek Pike	13,534	9,727	-3,807	-28%
6	New Design Rd	19,390	19,136	-254	-1%
7	I-270	117,990	140,948	22,958	19%
8	Buckeystown Pike	27,370	21,490	-5,880	-21%
9	Urbana Pike	21,602	12,712	-8,890	-41%
10	Reichs Ford Rd	3,780	3,119	-661	-17%
11	Old National Pike	16,220	4,638	-11,582	-71%
	Subtotal*	288,116	307,940	19,824	7%

Screenline I-270-2

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Catoctin Mountain Hwy	21,180	29,767	8,587	41%
2	Ballenger Creek Pike	N/A	3,991	N/A	N/A
3	New Design Rd	N/A	2,970	N/A	N/A
4	Buckeystown Pike	6,850	10,242	3,392	50%
5	Park Mills Rd	N/A	2,708	N/A	N/A
6	I-270	90,110	117,287	27,177	30%
7	Urbana Pike	13,070	9,444	-3,626	-28%
8	Sugarloaf Pkwy	N/A	702	N/A	N/A
9	Ijamsville Rd	N/A	8,259	N/A	N/A
10	Ed McClain Rd	N/A	4,222	N/A	N/A
11	Green Valley Rd	6,924	17,586	10,662	154%
	Subtotal*	138,134	184,326	46,192	33%

Note: * Links with no count are excluded from screenline subtotals.

Screenline I-270-3

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Clopper Rd	24,232	26,008	1,776	7%
2	Wisteria Dr	13,272	394	-12,878	-97%
3	Middlebrook Rd	24,540	17,162	-7,378	-30%
4	I-270	136,930	158,538	21,608	16%
5	Frederick Rd	32,130	47,799	15,669	49%
	Subtotal*	231,104	249,901	18,797	8%

Screenline I-270-4

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Darnestown Rd	27,952	33,296	5,344	19%
2	Great Seneca Hwy	42,620	31,364	-11,256	-26%
3	West Diamond Ave	50,492	35,977	-14,515	-29%
4	I-270	183,660	210,107	26,447	14%
5	North Frederick Ave	36,120	32,181	-3,939	-11%
6	Lost Knife Rd	N/A	3,791	N/A	N/A
7	Midcounty Hwy	22,790	16,448	-6,342	-28%
	Subtotal*	363,634	359,373	-4,261	-1%

Screenline I-270-5

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Great Seneca Hwy	29,372	26,107	-3,265	-11%
2	Omega Rd	N/A	6,779	N/A	N/A
3	Shady Grove Rd	39,630	34,449	-5,181	-13%
4	I-270	224,250	247,714	23,464	10%
5	Piccard Dr	N/A	7,442	N/A	N/A
6	Gaither Rd	N/A	6,646	N/A	N/A
7	Grand Champion Dr	N/A	741	N/A	N/A
8	Frederick Rd	45,500	33,757	-11,743	-26%
	Subtotal*	338,752	342,027	3,275	1%

Note: * Links with no count are excluded from screenline subtotals.

Screenline I-270-6

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Falls Rd	20,684	18,481	-2,203	-11%
2	Seven Locks Rd	N/A	28,829	N/A	N/A
3	I-270	263,740	291,427	27,687	10%
4	Tower Oaks Blvd	11,272	11,772	500	4%
5	Rockville Pike	49,580	42,255	-7,325	-15%
6	Twinbrook Pkwy	N/A	24,633	N/A	N/A
7	Veirs Mill Rd	44,800	48,481	3,681	8%
8	Bauer Dr	N/A	3,574	N/A	N/A
9	Georgia Ave	46,190	61,341	15,151	33%
	Subtotal*	436,266	473,757	37,491	9%

Screenline I-270-7

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Falls Rd	21,074	23,256	2,182	10%
2	Seven Locks Rd	N/A	20,802	N/A	N/A
3	I-270	268,380	293,792	25,412	9%
4	Old Georgetown Rd	N/A	38,956	N/A	N/A
5	Rockville Pike	54,870	50,980	-3,890	-7%
6	Connecticut Ave	40,802	57,626	16,824	41%
7	Veirs Mill Rd	40,340	49,613	9,273	23%
	Subtotal*	425,466	475,267	49,801	12%

Note: * Links with no count are excluded from screenline subtotals.

Screenline I-495-1

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	American Legion Bridge	231,716	282,575	50,859	22%
2	Chain Bridge	31,874	35,831	3,957	12%
3	Key Bridge	41,448	54,124	12,676	31%
4	Roosevelt Bridge	93,813	99,980	6,167	7%
5	Memorial Bridge	57,116	58,490	1,374	2%
6	14th Street Bridge	246,189	182,444	-63,745	-26%
7	Woodrow Wilson Bridge	214,292	222,444	8,152	4%
	Subtotal*	916,448	935,888	19,440	2%

Screenline I-495-2

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Falls Rd	21,094	16,675	-4,419	-21%
2	Bradley Blvd	7,992	10,447	2,455	31%
3	Seven Locks Rd	N/A	14,364	N/A	N/A
4	Capital Beltway	262,112	317,153	55,041	21%
5	Burdette Rd	N/A	6,957	N/A	N/A
6	Wilson La	11,124	13,175	2,051	18%
	Subtotal*	302,322	357,450	55,128	18%

Screenline I-495-3

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	I-270 East Spur	119,200	126,047	6,847	6%
2	Fernwood Rd	N/A	16,541	N/A	N/A
3	Rockledge Dr	N/A	6,459	N/A	N/A
4	Democracy Blvd	31,000	29,864	-1,136	-4%
5	Capital Beltway	119,170	139,201	20,031	17%
6	Greentree Rd	N/A	5,803	N/A	N/A
7	Bradley Blvd	15,262	9,689	-5,573	-37%
8	Wilson La	9,654	15,157	5,503	57%
	Subtotal*	294,286	319,958	25,672	9%

Note: * Links with no count are excluded from screenline subtotals.

Screenline I-495-4

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Randolph Rd	28,240	53,714	25,474	90%
2	Lindell St	N/A	5,764	N/A	N/A
3	West University Blvd	33,810	50,111	16,301	48%
4	Veirs Mill Rd	26,446	23,982	-2,464	-9%
5	Plyers Mill Rd	N/A	11,834	N/A	N/A
6	Forest Glen Rd	9,690	7,619	-2,071	-21%
7	Capital Beltway	239,260	242,329	3,069	1%
8	Linden La	11,760	14,203	2,443	21%
9	16th St	29,402	22,993	-6,409	-22%
10	Spring St	N/A	11,561	N/A	N/A
11	East West Hwy	27,020	37,311	10,291	38%
12	Colesville Rd	16,132	20,890	4,758	29%
	Subtotal*	421,760	473,152	51,392	12%

Screenline I-495-5

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	ICC	50,724	68,638	17,914	35%
2	Randolph Rd	38,192	41,547	3,355	9%
3	Columbia Pike	65,682	94,668	28,986	44%
4	Powder Mill Rd	N/A	10,920	N/A	N/A
5	Capital Beltway	265,484	280,772	15,288	6%
6	Adelphi Rd	N/A	34,996	N/A	N/A
7	Metzerott Rd	N/A	12,672	N/A	N/A
8	Merrimac Dr	N/A	5,577	N/A	N/A
9	University Blvd	41,000	41,134	134	0%
10	Erskine St	N/A	5,327	N/A	N/A
11	East West Hwy	24,432	24,020	-412	-2%
	Subtotal*	485,514	550,779	65,265	13%

Note: * Links with no count are excluded from screenline subtotals.

Screenline I-495-6

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Cheverly Ave	10,160	4,351	-5,809	-57%
2	Landover Rd	42,482	43,350	868	2%
3	Annapolis Rd	39,364	21,925	-17,439	-44%
4	Veterans Pkwy	23,872	13,536	-10,336	-43%
5	Riverdale Rd	N/A	15,124	N/A	N/A
6	Good Luck Rd	N/A	13,861	N/A	N/A
7	Capital Beltway	200,390	200,117	-273	0%
8	Greenbelt Rd	57,230	52,706	-4,524	-8%
9	Explorer Rd	N/A	6,098	N/A	N/A
10	Soil Conservation Rd	N/A	5,768	N/A	N/A
11	Springfield Rd	N/A	11,476	N/A	N/A
12	Laurel Bowie Rd	20,302	22,898	2,596	13%
	Subtotal*	393,800	358,883	-34,917	-9%

Screenline I-495-7

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Kenilworth Ave	175,792	142,763	-33,029	-19%
2	Columbia Park Rd	19,720	8,991	-10,729	-54%
3	Landover Rd	48,292	40,781	-7,511	-16%
4	Veterans Pkwy	N/A	7,631	N/A	N/A
5	Ardwick-Ardmore Rd	9,482	10,432	950	10%
6	Capital Beltway	222,510	224,762	2,252	1%
7	Whitfield Chapel Rd	10,400	5,326	-5,074	-49%
8	Martin Luther King Jr. Hwy	27,992	35,222	7,230	26%
9	Lottsford Vista Rd	10,490	8,797	-1,693	-16%
10	Enterprise Rd	17,272	13,062	-4,210	-24%
11	Church Rd	6,020	5,769	-251	-4%
12	Collington Rd	N/A	39,621	N/A	N/A
13	Crain Hwy	64,452	51,068	-13,384	-21%
	Subtotal*	612,422	546,973	-65,449	-11%

Note: * Links with no count are excluded from screenline subtotals.

Screenline I-495-8

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Anacostia Fwy	109,904	80,120	-29,784	-27%
2	Minnesota St	N/A	23,542	N/A	N/A
3	Ridge Rd SE	N/A	10,196	N/A	N/A
4	Texas Ave SE	6,378	1,295	-5,083	-80%
5	Benning Rd SE	16,718	15,226	-1,492	-9%
6	F St SE	N/A	4,887	N/A	N/A
7	Southern Ave SE	13,476	26,644	13,168	98%
8	Larchmont Ave	N/A	10,022	N/A	N/A
9	Suffolk Ave	N/A	3,359	N/A	N/A
10	Rollins Ave	N/A	1,464	N/A	N/A
11	Addison Rd	19,492	18,029	-1,463	-8%
12	Shady Glen Dr	N/A	11,719	N/A	N/A
13	Ritchie Rd	N/A	18,853	N/A	N/A
14	Capital Beltway	218,552	194,646	-23,906	-11%
15	Harry S Truman Dr	N/A	18,243	N/A	N/A
16	Largo Rd	41,842	30,752	-11,090	-27%
17	Campus Way S	N/A	9,415	N/A	N/A
18	Kettering Dr	N/A	5,687	N/A	N/A
19	Watkins Park Dr	15,224	14,985	-239	-2%
20	Church Rd	N/A	3,555	N/A	N/A
21	Crain Hwy	55,382	54,554	-828	-1%
	Subtotal*	496,968	436,251	-60,717	-12%

Screenline I-495-9

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Suitland Pkwy	36,772	19,064	-17,708	-48%
2	Silver Hill Rd	42,240	35,780	-6,460	-15%
3	Auth Rd	N/A	8,868	N/A	N/A
4	Capital Beltway	197,600	167,731	-29,869	-15%
5	Allentown Rd	35,072	30,137	-4,935	-14%
6	Old Alexander Ferry Rd	N/A	14,527	N/A	N/A
7	Woodyard Rd	19,962	16,587	-3,375	-17%
8	Surratts Rd	N/A	2,656	N/A	N/A
9	Dyson Rd	N/A	1,351	N/A	N/A
10	Mattawoman Dr	N/A	835	N/A	N/A
11	Crain Hwy	31,280	29,220	-2,060	-7%
	Subtotal*	362,926	298,519	-64,407	-18%

Note: * Links with no count are excluded from screenline subtotals.

Screenline MD-295-1

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	I-95	207,324	261,557	54,233	26%
2	Washington Blvd	38,432	42,076	3,644	9%
3	MD 295	108,450	92,585	-15,865	-15%
4	Aviation Blvd	20,480	30,216	9,736	48%
5	Aviation Ave	21,070	13,998	-7,072	-34%
6	I-97	111,820	127,029	15,209	14%
	Subtotal*	507,576	567,461	59,885	12%

Screenline MD-295-2

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Columbia Pike	91,082	113,681	22,599	25%
2	Broken Land Pkwy	N/A	38,247	N/A	N/A
3	I-95	217,540	275,040	57,500	26%
4	Washington Blvd	27,222	44,416	17,194	63%
5	Brock Bridge Rd	N/A	7,323	N/A	N/A
6	MD 295	121,752	107,288	-14,464	-12%
7	Annapolis Rd	N/A	16,755	N/A	N/A
8	Telegraph Rd	25,192	35,271	10,079	40%
9	Clark Station Rd	N/A	6,027	N/A	N/A
10	New Cut Rd	12,052	15,213	3,161	26%
11	I-97	127,602	147,304	19,702	15%
	Subtotal*	622,442	738,213	115,771	19%

Screenline MD-295-3

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Columbia Pike	62,110	100,131	38,021	61%
2	I-95	206,640	246,573	39,933	19%
3	Old Gunpowder Rd	N/A	18,846	N/A	N/A
4	Virginia Manor Rd	N/A	15,538	N/A	N/A
5	Baltimore Ave	34,512	44,602	10,090	29%
6	Montpelier Dr	N/A	7,098	N/A	N/A
7	Muirkirk Rd	N/A	9,646	N/A	N/A
8	Laurel Bowie Rd	57,132	43,785	-13,347	-23%
9	MD 295	105,852	95,239	-10,613	-10%
	Subtotal*	466,246	530,330	64,084	14%

Note: * Links with no count are excluded from screenline subtotals.

Screenline MD-295-4

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Columbia Pike	72,572	91,472	18,900	26%
2	New Hampshire Ave	57,900	85,273	27,373	47%
3	Riggs Rd	N/A	14,910	N/A	N/A
4	Cherry Hill Rd	22,004	19,613	-2,391	-11%
5	I-95	200,180	245,573	45,393	23%
6	Sellman Rd	N/A	2,088	N/A	N/A
7	Baltimore Ave	47,640	64,308	16,668	35%
8	Rhode Island Ave	N/A	4,942	N/A	N/A
9	Cherrywood La	9,552	10,236	684	7%
10	Kenilworth Ave	36,330	31,675	-4,655	-13%
11	Greenbelt Rd	52,230	41,038	-11,192	-21%
12	MD 295	128,132	105,196	-22,936	-18%
13	Good Luck Rd	N/A	13,599	N/A	N/A
14	Annapolis Rd	69,420	48,459	-20,961	-30%
	Subtotal*	695,960	742,843	46,883	7%

Screenline MD-295-5

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Baltimore Ave	37,092	51,194	14,102	38%
2	Kenilworth Ave	41,110	27,678	-13,432	-33%
3	MD 295	113,764	88,878	-24,886	-22%
4	Capital Beltway	200,390	200,117	-273	0%
	Subtotal*	392,356	367,867	-24,489	-6%

Screenline MD-295-6

Sequence	Facility	Observed	Simulated	Difference	% Diff.
1	Bladenburg Rd	16,716	23,943	7,227	43%
2	Kenilworth Ave	33,510	38,037	4,527	14%
3	MD 295	123,292	101,045	-22,247	-18%
4	Cheverly Ave	10,160	4,351	-5,809	-57%
5	Landover Rd	42,482	43,350	868	2%
6	Cooper Lane	N/A	4,993	N/A	N/A
7	Veterans Pkwy	N/A	25,671	N/A	N/A
8	Capital Beltway	216,120	212,565	-3,555	-2%
	Subtotal*	442,280	423,291	-18,989	-4%

Note: * Links with no count are excluded from screenline subtotals.

Table B2. 2016 Validation: 2015 Observed vs. 2016 Simulated AAWDT Volumes on I-270 / I-495 / MD 295

I-270 Locations

Sequence	Location	Observed	Simulated	Difference	% Diff.
1	IS270-.40 MI S OF NEW DESIGN RD	117,990	140,948	22,958	19%
2	IS270-.20 MI S OF BAKER VALLEY RD	90,110	117,287	27,177	30%
3	IS270-50ft S OF FREDERICK CO/L	85,730	124,562	38,832	45%
4	IS270-.50 MI N OF MD121	83,930	127,837	43,907	52%
5	IS 270 South of MD 121 (ATR#04)	105,544	141,566	36,022	34%
6	IS270-.40 MI N OF MD118	121,110	147,808	26,698	22%
7	IS270-.30 MI S OF MD118	136,930	158,538	21,608	16%
8	IS270-.50 MI S OF MIDDLEBROOK RD	175,364	190,777	15,413	9%
9	IS270-.30 MI S OF MD124	183,660	210,107	26,447	14%
10	IS270-.50 MI N OF IS370	231,120	237,465	6,345	3%
11	IS270-.30 MI N OF SHADY GROVE RD	224,730	231,337	6,607	3%
12	IS270-.50 MI N OF MD28	224,250	247,714	23,464	10%
13	IS270-.30 MI S OF MD28	248,810	287,651	38,841	16%
14	IS270-.30 MI N OF MD927 (MONTROSE RD)	263,740	291,427	27,687	10%
15	IS270-.10 MI N OF TUCKERMAN LA	268,380	293,792	25,412	9%
16	IS270Y-.30 MI N OF WESTLAKE TERR	131,850	167,745	35,895	27%
17	IS270Y-.40 MI S OF DEMOCRACY BLVD	133,170	177,952	44,782	34%
18	IS270-.30 MI N OF MD187B	119,200	126,047	6,847	6%
19	IS270-.10 MI S OF MD187	112,380	105,487	-6,893	-6%

I-495 Locations

Sequence	Location	Observed	Simulated	Difference	% Diff.
1	IS495-.10 MI E OF PERSIMMON TREE RD	231,716	239,294	7,578	3%
2	IS495-.70 MI N OF MD190	262,112	317,153	55,041	21%
3	IS495-.50 MI W OF MD187	119,170	139,201	20,031	17%
4	IS495-.30 MI E OF MD187	112,890	134,833	21,943	19%
5	IS495-.20 MI E OF MD355	223,330	244,879	21,549	10%
6	IS495-.80 MI W OF MD97	239,260	242,329	3,069	1%
7	IS495-.20 MI E OF MD97	229,740	234,955	5,215	2%
8	IS495-.20 MI E OF US29	219,320	225,967	6,647	3%
9	IS 495 West of MD 650 (ATR#41)	215,924	237,779	21,855	10%
10	IS495-.10 MI W OF MD212	265,484	280,772	15,288	6%
11	IS95-.30 MI N OF US1	212,110	227,076	14,966	7%
12	IS95-.40 MI S OF US1	223,590	201,338	-22,252	-10%
13	IS95-.30 MI N OF MD201	216,200	191,155	-25,045	-12%
14	IS95-.30 MI S OF MD201	207,020	199,218	-7,802	-4%
15	IS 95 North of Good Luck Rd (ATR#55)	200,390	200,117	-273	0%
16	IS95-.60 MI N OF IS595/US50	216,120	212,565	-3,555	-2%
17	IS95-.10 MI S OF MD704	222,510	224,762	2,252	1%
18	IS95-.40 MI S OF MD202	208,610	214,610	6,000	3%
19	IS 95 South of MD 214 (ATR#43)	218,552	194,646	-23,906	-11%
20	IS95-.50 MI N OF MD4	227,452	193,249	-34,203	-15%
21	IS95-.40 MI S OF MD4	202,400	176,319	-26,081	-13%
22	IS95-.40 MI N OF MD5	197,600	167,731	-29,869	-15%
23	IS 95 at Temple Hill Rd (ATR#49)	162,226	149,136	-13,090	-8%
24	IS95-.40 MI S OF MD414	170,630	148,784	-21,846	-13%
25	IS95-.30 MI S OF MD210	175,912	172,551	-3,361	-2%
26	IS95-.50 MI N OF VIRGINIA ST/L	214,292	222,444	8,152	4%

MD 295 Locations

Sequence	Location	Observed	Simulated	Difference	% Diff.
1	MD295-.10 MI S OF BALTIMORE CO/L	104,412	84,912	-19,500	-19%
2	MD295-.20 MI S OF IS695	99,332	73,695	-25,637	-26%
3	MD295-.60 MI N OF IS195	121,920	74,891	-47,029	-39%
4	MD295-.30 MI N OF MD100	108,450	92,585	-15,865	-15%
5	MD295-.60 MI S OF MD100	109,500	103,443	-6,057	-6%
6	MD295-.25 MI S OF MD175	121,752	107,288	-14,464	-12%
7	MD295-.50 MI S OF MD32	112,552	115,358	2,806	2%
8	MD295-.30 MI N OF MD197	105,852	95,239	-10,613	-10%
9	MD295-.60 MI S OF MD197	117,252	105,206	-12,046	-10%
10	MD295-.40 MI N OF MD193	110,372	91,028	-19,344	-18%
11	MD295-.30 MI N OF IS95	128,132	105,196	-22,936	-18%
12	MD295-.30 MI S OF IS95	113,764	88,878	-24,886	-22%
13	MD295-.20 MI N OF MD450	118,780	90,848	-27,932	-24%
14	MD295-.20 MI N OF MD202	117,960	101,312	-16,648	-14%
15	MD295-.50 MI N OF US50	123,292	101,045	-22,247	-18%

Table B3. 2040 Simulated AAWDT Volumes by Facility for I-270 / I-495 / MD 295 Screenlines

Screenline I-270-1

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Jefferson Blvd	1,498	1,461	1,447	1,293
2	Old Swimming Pool Rd	1,553	1,531	1,526	1,361
3	Jefferson Pike	7,046	7,088	7,030	7,244
4	US-15	113,502	114,139	113,638	114,838
5	Balenger Creek Pike	11,456	11,167	11,271	10,741
6	New Design Rd	21,862	21,625	21,598	21,507
7	I-270	169,723	170,268	170,088	189,284
8	Buckeystown Pike	33,024	32,839	32,951	35,481
9	Urbana Pike	17,517	17,609	17,550	14,621
10	Reichs Ford Rd	4,452	4,451	4,474	4,325
11	Old National Pike	8,172	8,422	8,307	5,981
	Subtotal*	389,806	390,599	389,881	406,676

Screenline I-270-2

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Catoctin Mountain Hwy	32,326	32,538	32,455	31,495
2	Ballenger Creek Pike	5,998	5,709	5,767	4,693
3	New Design Rd	5,309	5,119	5,157	3,636
4	Buckeystown Pike	15,558	15,393	15,303	12,550
5	Park Mills Rd	4,117	4,138	4,068	3,482
6	I-270	131,876	132,442	132,264	160,445
7	Urbana Pike	9,965	10,138	10,053	9,547
8	Sugarloaf Pkwy	882	961	855	667
9	Ijamsville Rd	15,107	15,175	15,117	14,675
10	Ed McClain Rd	7,263	7,321	7,242	7,247
11	Green Valley Rd	18,938	18,917	18,901	19,069
	Subtotal*	247,339	247,849	247,183	267,505

Screenline I-270-3

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Clopper Rd	21,257	21,223	21,221	20,756
2	Wisteria Dr	975	958	963	925
3	Middlebrook Rd	32,709	32,641	32,502	31,667
4	I-270	178,758	178,951	178,549	197,252
5	Frederick Rd	36,503	36,835	36,644	36,004
	Subtotal*	270,202	270,608	269,879	286,604

Note: * All links on the screenlines are included.

Screenline I-270-4

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Darnestown Rd	31,186	31,056	31,016	30,333
2	Great Seneca Hwy	35,414	35,509	35,266	34,892
3	West Diamond Ave	35,201	35,303	35,041	34,583
4	I-270	254,437	254,795	253,262	270,077
5	North Frederick Ave	36,720	36,656	36,606	35,752
6	Lost Knife Rd	3,476	3,390	3,459	3,430
7	Midcounty Hwy	31,307	30,841	31,038	30,768
	Subtotal*	427,742	427,549	425,688	439,835

Screenline I-270-5

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Great Seneca Hwy	25,013	24,776	25,301	25,281
2	Omega Rd	12,641	12,749	12,700	12,545
3	Shady Grove Rd	34,221	34,717	35,659	34,996
4	I-270	293,859	300,123	285,453	300,752
5	Piccard Dr	9,513	9,472	9,513	9,491
6	Gaither Rd	8,930	8,742	9,381	8,843
7	Grand Champion Dr	1,101	1,077	1,236	1,090
8	Frederick Rd	38,346	38,415	38,874	37,974
	Subtotal*	423,624	430,071	418,117	430,972

Screenline I-270-6

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Falls Rd	19,251	19,116	19,211	19,016
2	Seven Locks Rd	31,197	30,714	30,758	30,352
3	I-270	335,117	339,243	323,887	339,306
4	Tower Oaks Blvd	14,748	14,196	14,874	14,497
5	Rockville Pike	49,314	49,247	49,806	49,074
6	Twinbrook Pkwy	23,963	22,961	23,321	22,836
7	Veirs Mill Rd	41,768	41,126	41,492	41,396
8	Bauer Dr	4,764	4,539	4,843	4,466
9	Georgia Ave	68,274	68,357	68,894	67,710
	Subtotal*	588,394	589,498	577,086	588,655

Note: * All links on the screenlines are included.

Screenline I-270-7

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Falls Rd	24,459	24,485	24,718	24,454
2	Seven Locks Rd	20,330	20,459	20,761	20,308
3	I-270	335,698	338,885	322,130	339,594
4	Old Georgetown Rd	49,086	48,323	48,638	48,284
5	Rockville Pike	61,394	62,981	63,085	62,828
6	Connecticut Ave	59,819	60,377	60,986	59,653
7	Veirs Mill Rd	53,697	52,706	52,890	52,685
	Subtotal*	604,483	608,216	593,208	607,807

Screenline I-495-1

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	American Legion Bridge	320,989	362,972	350,317	365,892
2	Chain Bridge	43,420	40,414	41,771	39,857
3	Key Bridge	55,159	53,985	54,824	54,000
4	Roosevelt Bridge	115,955	113,385	114,645	113,403
5	Memorial Bridge	69,430	67,611	68,397	67,800
6	14th Street Bridge	195,026	192,457	193,121	192,441
7	Woodrow Wilson Bridge	254,592	250,123	252,518	250,647
	Subtotal*	1,054,571	1,080,947	1,075,592	1,084,039

Screenline I-495-2

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Falls Rd	19,348	18,238	19,210	17,958
2	Bradley Blvd	11,600	10,886	11,552	10,866
3	Seven Locks Rd	16,706	15,967	16,894	15,745
4	Capital Beltway	344,957	386,896	364,715	392,132
5	Burdette Rd	9,395	8,612	9,406	8,379
6	Wilson La	15,356	14,636	14,715	14,510
	Subtotal*	417,362	455,235	436,491	459,590

Note: * All links on the screenlines are included.

Screenline I-495-3

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	I-270 East Spur	136,806	142,064	133,712	142,763
2	Fernwood Rd	17,908	22,640	20,477	23,616
3	Rockledge Dr	8,046	3,506	5,211	3,463
4	Democracy Blvd	33,803	32,627	31,221	33,633
5	Capital Beltway	146,814	193,818	182,983	196,241
6	Greentree Rd	7,683	6,687	7,085	6,671
7	Bradley Blvd	10,256	10,653	10,473	10,598
8	Wilson La	15,500	14,866	15,312	14,867
	Subtotal*	376,816	426,861	406,475	431,850

Screenline I-495-4

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Randolph Rd	60,658	57,956	58,943	58,359
2	Lindell St	6,075	5,831	5,928	5,906
3	West University Blvd	55,033	54,002	54,310	54,483
4	Veirs Mill Rd	27,143	26,470	26,634	26,253
5	Plyers Mill Rd	12,217	12,034	12,178	12,089
6	Forest Glen Rd	8,263	8,074	8,243	8,133
7	Capital Beltway	250,875	317,168	289,672	321,806
8	Linden La	14,742	13,999	14,350	14,269
9	16th St	28,159	28,416	28,681	28,704
10	Spring St	13,047	12,222	12,510	12,439
11	East West Hwy	38,973	38,845	38,434	38,839
12	Colesville Rd	23,259	23,148	22,657	22,466
	Subtotal*	538,443	598,166	572,540	603,746

Screenline I-495-5

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	ICC	81,909	74,160	77,454	75,947
2	Randolph Rd	45,633	43,971	44,855	44,521
3	Columbia Pike	102,984	102,512	102,652	101,452
4	Powder Mill Rd	10,981	10,398	10,639	10,402
5	Capital Beltway	292,711	347,938	325,965	353,584
6	Adelphi Rd	39,190	40,089	40,031	39,517
7	Metzerott Rd	16,790	15,859	16,311	15,797
8	Merrimac Dr	6,447	6,385	6,502	6,514
9	University Blvd	40,393	39,914	40,018	40,065
10	Erskine St	6,313	6,292	6,298	6,305
11	East West Hwy	28,290	26,834	27,546	26,794
	Subtotal*	671,641	714,351	698,271	720,898

Note: * All links on the screenlines are included.

Screenline I-495-6

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Cheverly Ave	4,693	4,142	4,341	4,210
2	Landover Rd	47,412	46,233	46,825	44,296
3	Annapolis Rd	24,139	22,763	23,364	21,354
4	Veterans Pkwy	15,104	14,675	14,799	14,727
5	Riverdale Rd	15,434	15,343	15,499	14,713
6	Good Luck Rd	20,899	20,846	20,971	20,647
7	Capital Beltway	212,342	236,948	228,353	242,030
8	Greenbelt Rd	53,577	53,844	53,932	53,579
9	Explorer Rd	6,940	6,401	6,561	6,913
10	Soil Conservation Rd	8,024	6,959	7,434	6,587
11	Springfield Rd	13,910	13,108	13,485	12,693
12	Laurel Bowie Rd	26,472	25,884	26,290	25,193
	Subtotal*	448,946	467,147	461,854	466,943

Screenline I-495-7

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Kenilworth Ave	149,482	144,860	146,972	149,443
2	Columbia Park Rd	13,467	12,456	12,960	12,919
3	Landover Rd	46,833	46,012	46,516	45,488
4	Veterans Pkwy	8,716	8,263	8,512	8,212
5	Ardwick-Ardmore Rd	10,303	9,677	10,113	9,581
6	Capital Beltway	240,128	272,780	258,900	274,019
7	Whitfield Chapel Rd	7,303	6,365	6,896	6,069
8	Martin Luther King Jr. Hwy	38,586	36,684	37,474	36,330
9	Lottsford Vista Rd	13,560	10,084	12,018	9,807
10	Enterprise Rd	15,021	13,292	13,932	13,276
11	Church Rd	8,514	6,867	7,525	6,549
12	Collington Rd	44,804	43,907	44,453	44,385
13	Crain Hwy	63,723	61,545	62,404	60,328
	Subtotal*	660,440	672,793	668,675	676,407

Note: * All links on the screenlines are included.

Screenline I-495-8

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Anacostia Fwy	78,339	76,746	77,644	77,554
2	Minnesota St	22,061	21,691	21,869	21,755
3	Ridge Rd SE	10,230	10,204	10,238	10,152
4	Texas Ave SE	2,597	2,133	2,356	2,210
5	Benning Rd SE	18,359	18,185	18,245	18,225
6	F St SE	6,130	5,775	5,958	5,715
7	Southern Ave SE	31,382	30,690	30,979	30,594
8	Larchmont Ave	11,528	11,102	11,193	10,979
9	Suffolk Ave	4,986	4,547	4,707	4,257
10	Rollins Ave	3,588	3,018	3,101	2,853
11	Addison Rd	22,323	21,135	21,435	21,158
12	*Karen Blvd (Not Coded in 2016)*	*8,044*	*6,954*	*7,391*	*7,088*
13	Shady Glen Dr	10,662	10,227	10,395	10,223
14	Ritchie Rd	22,544	19,872	20,608	19,729
15	Capital Beltway	214,922	240,551	233,363	242,622
16	Harry S Truman Dr	18,562	18,344	18,320	18,383
17	Largo Rd	23,608	23,400	23,567	23,515
18	Campus Way S	10,493	10,070	9,882	10,192
19	Kettering Dr	8,412	6,807	7,280	6,447
20	Watkins Park Dr	16,106	15,253	15,560	15,424
21	Church Rd	7,234	5,542	6,271	4,832
22	Crain Hwy	62,156	61,169	61,325	60,372
	Subtotal*	614,266	623,414	621,688	624,279

Screenline I-495-9

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Suitland Pkwy	21,959	21,951	22,070	21,825
2	Silver Hill Rd	43,282	40,900	41,408	41,067
3	Auth Rd	12,583	12,916	12,742	12,913
4	*I-495 to Branch Ave. Metro Connection (New Facility)*	*4,305*	*4,217*	*4,239*	*4,204*
5	Capital Beltway	180,479	194,085	191,386	195,258
6	Allentown Rd	41,675	39,935	40,393	40,496
7	Old Alexander Ferry Rd	16,593	16,848	16,778	16,749
8	Woodyard Rd	20,095	19,656	19,804	19,579
9	Surratts Rd	3,405	3,438	3,394	3,378
10	Dyson Rd	3,467	3,232	3,291	3,154
11	Mattawoman Dr	2,309	2,282	2,341	2,263
12	Crain Hwy	29,392	27,955	28,277	26,808
	Subtotal*	379,544	387,415	386,122	387,694

Note: * All links on the screenlines are included.

Screenline MD-295-1

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	I-95	284,092	284,799	284,312	277,689
2	Washington Blvd	47,165	47,505	47,044	43,957
3	MD 295	106,492	107,176	107,222	144,461
4	Aviation Blvd	42,147	41,795	41,814	38,525
5	Aviation Ave	20,239	20,251	20,612	18,702
6	I-97	145,486	145,104	145,199	140,801
	Subtotal*	645,621	646,630	646,202	664,135

Screenline MD-295-2

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Columbia Pike	124,981	124,848	124,479	123,685
2	Broken Land Pkwy	49,628	49,573	49,426	47,841
3	I-95	293,151	294,475	293,837	289,588
4	Washington Blvd	43,040	43,155	43,294	41,079
5	Brock Bridge Rd	9,152	9,339	9,252	7,661
6	MD 295	119,185	119,572	119,616	166,254
7	Annapolis Rd	53,827	53,247	53,347	48,443
8	Telegraph Rd	36,909	36,945	37,078	35,683
9	Clark Station Rd	7,872	7,700	7,725	6,813
10	New Cut Rd	19,213	19,246	19,622	16,595
11	I-97	164,150	163,740	163,648	159,767
	Subtotal*	921,108	921,840	921,324	943,408

Screenline MD-295-3

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Columbia Pike	106,551	106,524	106,770	104,907
2	I-95	261,824	266,914	267,038	264,297
3	Old Gunpowder Rd	30,414	31,894	31,909	30,181
4	Virginia Manor Rd	17,044	18,178	18,460	16,875
5	Baltimore Ave	48,945	47,821	47,755	43,995
6	*Old Baltimore Pike Extended (New Facility)*	*6,390*	*6,477*	*6,609*	*5,251*
7	Montpelier Dr	8,382	8,693	8,615	7,071
8	Muirkirk Rd	11,506	11,842	11,841	12,449
9	Laurel Bowie Rd	51,535	50,808	51,415	54,790
10	MD 295	108,596	108,664	108,566	158,213
	Subtotal*	651,186	657,814	658,978	698,029

Note: * All links on the screenlines are included.

Screenline MD-295-4

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Columbia Pike	97,871	98,210	98,326	97,882
2	New Hampshire Ave	87,786	87,917	88,303	87,151
3	Riggs Rd	16,611	16,483	16,586	15,778
4	Cherry Hill Rd	34,986	35,696	36,014	34,705
5	I-95	259,564	270,144	268,886	267,177
6	Sellman Rd	2,676	2,627	2,716	2,440
7	Baltimore Ave	67,567	68,848	68,616	68,269
8	Rhode Island Ave	8,626	8,365	8,471	7,885
9	Cherrywood La	10,191	10,398	10,407	10,401
10	Kenilworth Ave	35,556	34,766	35,154	33,093
11	Greenbelt Rd	41,461	40,179	40,662	40,454
12	MD 295	109,023	113,433	112,008	151,014
13	Good Luck Rd	20,439	20,502	20,589	19,593
14	Annapolis Rd	50,269	51,112	50,540	50,039
	Subtotal*	842,627	858,680	857,276	885,880

Screenline MD-295-5

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Baltimore Ave	54,756	54,003	54,225	53,380
2	Kenilworth Ave	31,358	30,419	30,636	28,921
3	MD 295	96,911	93,292	94,997	121,787
4	Capital Beltway	212,342	236,948	228,353	242,030
	Subtotal*	395,368	414,662	408,211	446,117

Screenline MD-295-6

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Bladenburg Rd	23,317	22,552	22,816	21,940
2	Kenilworth Ave	40,365	38,168	38,863	34,576
3	MD 295	111,094	106,689	108,689	123,288
4	Cheverly Ave	4,693	4,142	4,341	4,210
5	Landover Rd	47,412	46,233	46,825	44,296
6	Cooper Lane	5,643	5,109	5,313	4,993
7	Veterans Pkwy	28,549	27,439	27,972	27,295
8	Capital Beltway	222,048	246,585	237,212	252,288
	Subtotal*	483,122	496,917	492,032	512,887

Note: * All links on the screenlines are included.

Table B4. 2040 Simulated AAWDT Volumes by Facility for I-270 / I-495 / MD 295 Screenlines; % Differences Relative to Alternative 1 (No Build)

Screenline I-270-1

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Jefferson Blvd	N/A	-2%	-3%	-14%
2	Old Swimming Pool Rd	N/A	-1%	-2%	-12%
3	Jefferson Pike	N/A	1%	0%	3%
4	US-15	N/A	1%	0%	1%
5	Balenger Creek Pike	N/A	-3%	-2%	-6%
6	New Design Rd	N/A	-1%	-1%	-2%
7	I-270	N/A	0%	0%	12%
8	Buckeystown Pike	N/A	-1%	0%	7%
9	Urbana Pike	N/A	1%	0%	-17%
10	Reichs Ford Rd	N/A	0%	0%	-3%
11	Old National Pike	N/A	3%	2%	-27%
	Subtotal*	N/A	0%	0%	4%

Screenline I-270-2

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Catoctin Mountain Hwy	N/A	1%	0%	-3%
2	Ballenger Creek Pike	N/A	-5%	-4%	-22%
3	New Design Rd	N/A	-4%	-3%	-32%
4	Buckeystown Pike	N/A	-1%	-2%	-19%
5	Park Mills Rd	N/A	1%	-1%	-15%
6	I-270	N/A	0%	0%	22%
7	Urbana Pike	N/A	2%	1%	-4%
8	Sugarloaf Pkwy	N/A	9%	-3%	-24%
9	Ijamsville Rd	N/A	0%	0%	-3%
10	Ed McClain Rd	N/A	1%	0%	0%
11	Green Valley Rd	N/A	0%	0%	1%
	Subtotal*	N/A	0%	0%	8%

Screenline I-270-3

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Clopper Rd	N/A	0%	0%	-2%
2	Wisteria Dr	N/A	-2%	-1%	-5%
3	Middlebrook Rd	N/A	0%	-1%	-3%
4	I-270	N/A	0%	0%	10%
5	Frederick Rd	N/A	1%	0%	-1%
	Subtotal*	N/A	0%	0%	6%

Note: * All links on the screenlines are included.

Screenline I-270-4

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Darnestown Rd	N/A	0%	-1%	-3%
2	Great Seneca Hwy	N/A	0%	0%	-1%
3	West Diamond Ave	N/A	0%	0%	-2%
4	I-270	N/A	0%	0%	6%
5	North Frederick Ave	N/A	0%	0%	-3%
6	Lost Knife Rd	N/A	-2%	-1%	-1%
7	Midcounty Hwy	N/A	-1%	-1%	-2%
	Subtotal*	N/A	0%	0%	3%

Screenline I-270-5

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Great Seneca Hwy	N/A	-1%	1%	1%
2	Omega Rd	N/A	1%	0%	-1%
3	Shady Grove Rd	N/A	1%	4%	2%
4	I-270	N/A	2%	-3%	2%
5	Piccard Dr	N/A	0%	0%	0%
6	Gaither Rd	N/A	-2%	5%	-1%
7	Grand Champion Dr	N/A	-2%	12%	-1%
8	Frederick Rd	N/A	0%	1%	-1%
	Subtotal*	N/A	2%	-1%	2%

Screenline I-270-6

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Falls Rd	N/A	-1%	0%	-1%
2	Seven Locks Rd	N/A	-2%	-1%	-3%
3	I-270	N/A	1%	-3%	1%
4	Tower Oaks Blvd	N/A	-4%	1%	-2%
5	Rockville Pike	N/A	0%	1%	0%
6	Twinbrook Pkwy	N/A	-4%	-3%	-5%
7	Veirs Mill Rd	N/A	-2%	-1%	-1%
8	Bauer Dr	N/A	-5%	2%	-6%
9	Georgia Ave	N/A	0%	1%	-1%
	Subtotal*	N/A	0%	-2%	0%

Note: * All links on the screenlines are included.

Screenline I-270-7

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Falls Rd	N/A	0%	1%	0%
2	Seven Locks Rd	N/A	1%	2%	0%
3	I-270	N/A	1%	-4%	1%
4	Old Georgetown Rd	N/A	-2%	-1%	-2%
5	Rockville Pike	N/A	3%	3%	2%
6	Connecticut Ave	N/A	1%	2%	0%
7	Veirs Mill Rd	N/A	-2%	-2%	-2%
	Subtotal*	N/A	1%	-2%	1%

Screenline I-495-1

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	American Legion Bridge	N/A	13%	9%	14%
2	Chain Bridge	N/A	-7%	-4%	-8%
3	Key Bridge	N/A	-2%	-1%	-2%
4	Roosevelt Bridge	N/A	-2%	-1%	-2%
5	Memorial Bridge	N/A	-3%	-1%	-2%
6	14th Street Bridge	N/A	-1%	-1%	-1%
7	Woodrow Wilson Bridge	N/A	-2%	-1%	-2%
	Subtotal*	N/A	3%	2%	3%

Screenline I-495-2

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Falls Rd	N/A	-6%	-1%	-7%
2	Bradley Blvd	N/A	-6%	0%	-6%
3	Seven Locks Rd	N/A	-4%	1%	-6%
4	Capital Beltway	N/A	12%	6%	14%
5	Burdette Rd	N/A	-8%	0%	-11%
6	Wilson La	N/A	-5%	-4%	-6%
	Subtotal*	N/A	9%	5%	10%

Note: * All links on the screenlines are included.

Screenline I-495-3

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	I-270 East Spur	N/A	4%	-2%	4%
2	Fernwood Rd	N/A	26%	14%	32%
3	Rockledge Dr	N/A	-56%	-35%	-57%
4	Democracy Blvd	N/A	-3%	-8%	-1%
5	Capital Beltway	N/A	32%	25%	34%
6	Greentree Rd	N/A	-13%	-8%	-13%
7	Bradley Blvd	N/A	4%	2%	3%
8	Wilson La	N/A	-4%	-1%	-4%
	Subtotal*	N/A	13%	8%	15%

Screenline I-495-4

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Randolph Rd	N/A	-4%	-3%	-4%
2	Lindell St	N/A	-4%	-2%	-3%
3	West University Blvd	N/A	-2%	-1%	-1%
4	Veirs Mill Rd	N/A	-2%	-2%	-3%
5	Plyers Mill Rd	N/A	-2%	0%	-1%
6	Forest Glen Rd	N/A	-2%	0%	-2%
7	Capital Beltway	N/A	26%	15%	28%
8	Linden La	N/A	-5%	-3%	-3%
9	16th St	N/A	1%	2%	2%
10	Spring St	N/A	-6%	-4%	-5%
11	East West Hwy	N/A	0%	-1%	0%
12	Colesville Rd	N/A	0%	-3%	-3%
	Subtotal*	N/A	11%	6%	12%

Screenline I-495-5

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	ICC	N/A	-9%	-5%	-7%
2	Randolph Rd	N/A	-4%	-2%	-2%
3	Columbia Pike	N/A	0%	0%	-1%
4	Powder Mill Rd	N/A	-5%	-3%	-5%
5	Capital Beltway	N/A	19%	11%	21%
6	Adelphi Rd	N/A	2%	2%	1%
7	Metzerott Rd	N/A	-6%	-3%	-6%
8	Merrimac Dr	N/A	-1%	1%	1%
9	University Blvd	N/A	-1%	-1%	-1%
10	Erskine St	N/A	0%	0%	0%
11	East West Hwy	N/A	-5%	-3%	-5%
	Subtotal*	N/A	6%	4%	7%

Note: * All links on the screenlines are included.

Screenline I-495-6

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Cheverly Ave	N/A	-12%	-7%	-10%
2	Landover Rd	N/A	-2%	-1%	-7%
3	Annapolis Rd	N/A	-6%	-3%	-12%
4	Veterans Pkwy	N/A	-3%	-2%	-2%
5	Riverdale Rd	N/A	-1%	0%	-5%
6	Good Luck Rd	N/A	0%	0%	-1%
7	Capital Beltway	N/A	12%	8%	14%
8	Greenbelt Rd	N/A	0%	1%	0%
9	Explorer Rd	N/A	-8%	-5%	0%
10	Soil Conservation Rd	N/A	-13%	-7%	-18%
11	Springfield Rd	N/A	-6%	-3%	-9%
12	Laurel Bowie Rd	N/A	-2%	-1%	-5%
	Subtotal*	N/A	4%	3%	4%

Screenline I-495-7

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Kenilworth Ave	N/A	-3%	-2%	0%
2	Columbia Park Rd	N/A	-8%	-4%	-4%
3	Landover Rd	N/A	-2%	-1%	-3%
4	Veterans Pkwy	N/A	-5%	-2%	-6%
5	Ardwick-Ardmore Rd	N/A	-6%	-2%	-7%
6	Capital Beltway	N/A	14%	8%	14%
7	Whitfield Chapel Rd	N/A	-13%	-6%	-17%
8	Martin Luther King Jr. Hwy	N/A	-5%	-3%	-6%
9	Lottsford Vista Rd	N/A	-26%	-11%	-28%
10	Enterprise Rd	N/A	-12%	-7%	-12%
11	Church Rd	N/A	-19%	-12%	-23%
12	Collington Rd	N/A	-2%	-1%	-1%
13	Crain Hwy	N/A	-3%	-2%	-5%
	Subtotal*	N/A	2%	1%	2%

Note: * All links on the screenlines are included.

Screenline I-495-8

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Anacostia Fwy	N/A	-2%	-1%	-1%
2	Minnesota St	N/A	-2%	-1%	-1%
3	Ridge Rd SE	N/A	0%	0%	-1%
4	Texas Ave SE	N/A	-18%	-9%	-15%
5	Benning Rd SE	N/A	-1%	-1%	-1%
6	F St SE	N/A	-6%	-3%	-7%
7	Southern Ave SE	N/A	-2%	-1%	-3%
8	Larchmont Ave	N/A	-4%	-3%	-5%
9	Suffolk Ave	N/A	-9%	-6%	-15%
10	Rollins Ave	N/A	-16%	-14%	-20%
11	Addison Rd	N/A	-5%	-4%	-5%
12	*Karen Blvd (Not Coded in 2016)*	*N/A*	*-14%*	*-8%*	*-12%*
13	Shady Glen Dr	N/A	-4%	-2%	-4%
14	Ritchie Rd	N/A	-12%	-9%	-12%
15	Capital Beltway	N/A	12%	9%	13%
16	Harry S Truman Dr	N/A	-1%	-1%	-1%
17	Largo Rd	N/A	-1%	0%	0%
18	Campus Way S	N/A	-4%	-6%	-3%
19	Kettering Dr	N/A	-19%	-13%	-23%
20	Watkins Park Dr	N/A	-5%	-3%	-4%
21	Church Rd	N/A	-23%	-13%	-33%
22	Crain Hwy	N/A	-2%	-1%	-3%
	Subtotal*	N/A	1%	1%	2%

Screenline I-495-9

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Suitland Pkwy	N/A	0%	1%	-1%
2	Silver Hill Rd	N/A	-6%	-4%	-5%
3	Auth Rd	N/A	3%	1%	3%
4	*I-495 to Branch Ave. Metro Connection (New Facility)*	*N/A*	*-2%*	*-2%*	*-2%*
5	Capital Beltway	N/A	8%	6%	8%
6	Allentown Rd	N/A	-4%	-3%	-3%
7	Old Alexander Ferry Rd	N/A	2%	1%	1%
8	Woodyard Rd	N/A	-2%	-1%	-3%
9	Surratts Rd	N/A	1%	0%	-1%
10	Dyson Rd	N/A	-7%	-5%	-9%
11	Mattawoman Dr	N/A	-1%	1%	-2%
12	Crain Hwy	N/A	-5%	-4%	-9%
	Subtotal*	N/A	2%	2%	2%

Note: * All links on the screenlines are included.

Screenline MD-295-1

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	I-95	N/A	0%	0%	-2%
2	Washington Blvd	N/A	1%	0%	-7%
3	MD 295	N/A	1%	1%	36%
4	Aviation Blvd	N/A	-1%	-1%	-9%
5	Aviation Ave	N/A	0%	2%	-8%
6	I-97	N/A	0%	0%	-3%
	Subtotal*	N/A	0%	0%	3%

Screenline MD-295-2

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Columbia Pike	N/A	0%	0%	-1%
2	Broken Land Pkwy	N/A	0%	0%	-4%
3	I-95	N/A	0%	0%	-1%
4	Washington Blvd	N/A	0%	1%	-5%
5	Brock Bridge Rd	N/A	2%	1%	-16%
6	MD 295	N/A	0%	0%	39%
7	Annapolis Rd	N/A	-1%	-1%	-10%
8	Telegraph Rd	N/A	0%	0%	-3%
9	Clark Station Rd	N/A	-2%	-2%	-13%
10	New Cut Rd	N/A	0%	2%	-14%
11	I-97	N/A	0%	0%	-3%
	Subtotal*	N/A	0%	0%	2%

Screenline MD-295-3

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Columbia Pike	N/A	0%	0%	-2%
2	I-95	N/A	2%	2%	1%
3	Old Gunpowder Rd	N/A	5%	5%	-1%
4	Virginia Manor Rd	N/A	7%	8%	-1%
5	Baltimore Ave	N/A	-2%	-2%	-10%
6	*Old Baltimore Pike Extended (New Facility)*	*N/A*	*1%*	*3%*	*-18%*
7	Montpelier Dr	N/A	4%	3%	-16%
8	Muirkirk Rd	N/A	3%	3%	8%
9	Laurel Bowie Rd	N/A	-1%	0%	6%
10	MD 295	N/A	0%	0%	46%
	Subtotal*	N/A	1%	1%	7%

Note: * All links on the screenlines are included.

Screenline MD-295-4

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Columbia Pike	N/A	0%	0%	0%
2	New Hampshire Ave	N/A	0%	1%	-1%
3	Riggs Rd	N/A	-1%	0%	-5%
4	Cherry Hill Rd	N/A	2%	3%	-1%
5	I-95	N/A	4%	4%	3%
6	Sellman Rd	N/A	-2%	1%	-9%
7	Baltimore Ave	N/A	2%	2%	1%
8	Rhode Island Ave	N/A	-3%	-2%	-9%
9	Cherrywood La	N/A	2%	2%	2%
10	Kenilworth Ave	N/A	-2%	-1%	-7%
11	Greenbelt Rd	N/A	-3%	-2%	-2%
12	MD 295	N/A	4%	3%	39%
13	Good Luck Rd	N/A	0%	1%	-4%
14	Annapolis Rd	N/A	2%	1%	0%
	Subtotal*	N/A	2%	2%	5%

Screenline MD-295-5

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Baltimore Ave	N/A	-1%	-1%	-3%
2	Kenilworth Ave	N/A	-3%	-2%	-8%
3	MD 295	N/A	-4%	-2%	26%
4	Capital Beltway	N/A	12%	8%	14%
	Subtotal*	N/A	5%	3%	13%

Screenline MD-295-6

Sequence	Facility	Alternative 1	Alternative 2	Alternative 3	Alternative 4
1	Bladenburg Rd	N/A	-3%	-2%	-6%
2	Kenilworth Ave	N/A	-5%	-4%	-14%
3	MD 295	N/A	-4%	-2%	11%
4	Cheverly Ave	N/A	-12%	-7%	-10%
5	Landover Rd	N/A	-2%	-1%	-7%
6	Cooper Lane	N/A	-9%	-6%	-12%
7	Veterans Pkwy	N/A	-4%	-2%	-4%
8	Capital Beltway	N/A	11%	7%	14%
	Subtotal*	N/A	3%	2%	6%

Note: * All links on the screenlines are included.

Table B5. 2040 Simulated AAWDT Volumes on I-270 / I-495 / MD 295

I-270 Locations

Seq#	Location	Alternative 1			Alternative 2			Alternative 3			Alternative 4		
		GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total
1	IS270-.40 MI S OF NEW DESIGN RD	169,723	0	169,723	170,268	0	170,268	170,088	0	170,088	170,927	18,357	189,284
2	IS270-.20 MI S OF BAKER VALLEY RD	131,876	0	131,876	132,442	0	132,442	132,264	0	132,264	127,241	33,204	160,445
3	IS270-50ft S OF FREDERICK CO/L	141,024	0	141,024	141,673	0	141,673	141,368	0	141,368	132,636	40,493	173,128
4	IS270-.50 MI N OF MD121	143,187	0	143,187	143,856	0	143,856	143,529	0	143,529	132,021	47,538	179,559
5	IS 270 South of MD 121 (ATR#04)	157,892	6,867	164,758	158,066	6,935	165,001	157,914	6,909	164,823	141,994	45,052	187,046
6	IS270-.40 MI N OF MD118	162,450	5,987	168,437	162,610	6,087	168,697	162,440	6,038	168,478	143,191	45,052	188,243
7	IS270-.30 MI S OF MD118	172,265	6,493	178,758	172,364	6,587	178,951	172,005	6,544	178,549	153,152	44,099	197,252
8	IS270-.50 MI S OF MIDDLEBROOK RD	201,089	6,493	207,582	201,067	6,587	207,653	200,730	6,544	207,274	180,786	44,099	224,885
9	IS270-.30 MI S OF MD124	247,647	6,791	254,437	247,811	6,984	254,795	246,368	6,894	253,262	231,074	39,003	270,077
10	IS270-.50 MI N OF IS370	269,426	11,260	280,686	261,460	19,581	281,041	262,993	16,026	279,019	256,448	39,003	295,451
11	IS270-.30 MI N OF SHADY GROVE RD	268,796	12,057	280,853	258,100	27,175	285,275	255,829	17,428	273,257	249,927	36,980	286,907
12	IS270-.50 MI N OF MD28	282,309	11,550	293,859	262,069	38,053	300,123	261,993	23,461	285,453	261,088	39,665	300,752
13	IS270-.30 MI S OF MD28	319,000	11,550	330,549	297,372	38,053	335,425	297,383	23,461	320,844	295,660	39,665	335,325
14	IS270-.30 MI N OF MD927 (MONTROSE RD)	322,967	12,150	335,117	301,190	38,053	339,243	300,426	23,461	323,887	299,642	39,665	339,306
15	IS270-.10 MI N OF TUCKERMAN LA	321,192	14,507	335,698	289,722	49,163	338,885	291,085	31,045	322,130	287,839	51,755	339,594
16	IS270Y-.30 MI N OF WESTLAKE TERR	187,217	11,675	198,893	164,865	31,956	196,821	166,076	22,342	188,418	163,863	32,969	196,832
17	IS270Y-.40 MI S OF DEMOCRACY BLVD	186,474	11,669	198,143	152,022	41,055	193,078	153,329	28,402	181,731	152,033	43,859	195,892
18	IS270-.30 MI N OF MD187B	133,974	2,832	136,806	124,857	17,207	142,064	125,009	8,703	133,712	123,976	18,786	142,763
19	IS270-.10 MI S OF MD187	111,860	2,636	114,495	107,702	17,207	124,909	107,234	8,703	115,938	107,357	18,786	126,143

I-495 Locations

Seq#	Location	Alternative 1			Alternative 2			Alternative 3			Alternative 4		
		GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total
1	IS495-.10 MI E OF PERSIMMON TREE RD	264,080	0	264,080	256,728	56,772	313,499	260,580	32,709	293,289	257,178	61,566	318,744
2	IS495-.70 MI N OF MD190	344,957	0	344,957	330,125	56,772	386,896	332,006	32,709	364,715	330,566	61,566	392,132
3	IS495-.50 MI W OF MD187	146,814	0	146,814	138,970	54,849	193,818	150,074	32,909	182,983	141,975	54,265	196,241
4	IS495-.30 MI E OF MD187	142,380	0	142,380	134,059	54,849	188,908	141,686	32,909	174,595	137,674	54,265	191,940
5	IS495-.20 MI E OF MD355	256,442	0	256,442	250,392	72,056	322,447	253,751	41,612	295,364	253,685	73,052	326,736
6	IS495-.80 MI W OF MD97	250,875	0	250,875	245,112	72,056	317,168	248,060	41,612	289,672	248,754	73,052	321,806
7	IS495-.20 MI E OF MD97	241,649	0	241,649	241,329	59,598	300,927	240,886	36,243	277,129	243,016	62,565	305,580
8	IS495-.20 MI E OF US29	235,021	0	235,021	230,617	59,598	290,215	231,047	36,243	267,290	232,548	62,565	295,112
9	IS 495 West of MD 650 (ATR#41)	253,528	0	253,528	248,434	59,598	308,032	249,306	36,243	285,549	250,917	62,565	313,482
10	IS495-.10 MI W OF MD212	292,711	0	292,711	288,340	59,598	347,938	289,722	36,243	325,965	291,019	62,565	353,584
11	IS95-.30 MI N OF US1	241,866	0	241,866	216,422	22,546	238,968	222,644	16,348	238,992	220,541	24,681	245,221
12	IS95-.40 MI S OF US1	215,856	0	215,856	208,311	22,546	230,857	210,721	16,348	227,069	206,533	24,681	231,214
13	IS95-.30 MI N OF MD201	204,455	0	204,455	190,582	30,513	221,095	195,463	21,172	216,635	189,443	32,181	221,624
14	IS95-.30 MI S OF MD201	212,579	0	212,579	200,322	30,513	230,835	204,132	21,172	225,304	199,285	32,181	231,466
15	IS 95 North of Good Luck Rd (ATR#55)	212,342	0	212,342	204,624	32,324	236,948	207,228	21,125	228,353	205,987	36,043	242,030
16	IS95-.60 MI N OF IS595/US50	222,048	0	222,048	214,260	32,324	246,585	216,087	21,125	237,212	216,246	36,043	252,288
17	IS95-.10 MI S OF MD704	240,128	0	240,128	227,081	45,700	272,780	232,758	26,142	258,900	227,860	46,160	274,019
18	IS95-.40 MI S OF MD202	228,942	0	228,942	226,932	32,514	259,445	226,314	21,568	247,882	227,431	33,404	260,835
19	IS 95 South of MD 214 (ATR#43)	214,922	0	214,922	208,037	32,514	240,551	211,795	21,568	233,363	209,218	33,404	242,622
20	IS95-.50 MI N OF MD4	210,845	0	210,845	207,172	24,395	231,567	207,472	19,162	226,634	207,608	25,662	233,269
21	IS95-.40 MI S OF MD4	200,506	0	200,506	192,781	24,395	217,176	194,650	19,162	213,812	193,327	25,662	218,989
22	IS95-.40 MI N OF MD5	180,479	0	180,479	169,690	24,395	194,085	172,224	19,162	191,386	169,597	25,662	195,258
23	IS 95 at Temple Hill Rd (ATR#49)	170,533	0	170,533	161,398	13,967	175,364	164,517	11,130	175,648	161,569	14,278	175,847
24	IS95-.40 MI S OF MD414	172,622	0	172,622	162,195	13,967	176,161	165,144	11,130	176,275	162,423	14,278	176,701
25	IS95-.30 MI S OF MD210	202,714	0	202,714	200,607	0	200,607	202,171	0	202,171	200,889	0	200,889
26	IS95-.50 MI N OF VIRGINIA ST/L	254,592	0	254,592	250,123	0	250,123	252,518	0	252,518	250,647	0	250,647

MD 295 Locations

Seq#	Location	Alternative 1			Alternative 2			Alternative 3			Alternative 4		
		GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total
1	MD295-.10 MI S OF BALTIMORE CO/L	102,907	0	102,907	102,908	0	102,908	102,907	0	102,907	102,906	0	102,906
2	MD295-.20 MI S OF IS695	82,356	0	82,356	82,025	0	82,025	82,764	0	82,764	69,229	34,917	104,146
3	MD295-.60 MI N OF IS195	82,372	0	82,372	81,915	0	81,915	82,632	0	82,632	69,166	34,917	104,082
4	MD295-.30 MI N OF MD100	106,492	0	106,492	107,176	0	107,176	107,222	0	107,222	96,881	47,580	144,461
5	MD295-.60 MI S OF MD100	122,722	0	122,722	122,940	0	122,940	122,989	0	122,989	114,052	51,781	165,833
6	MD295-.25 MI S OF MD175	119,185	0	119,185	119,572	0	119,572	119,616	0	119,616	114,473	51,781	166,254
7	MD295-.50 MI S OF MD32	120,412	0	120,412	120,590	0	120,590	120,465	0	120,465	115,210	53,749	168,959
8	MD295-.30 MI N OF MD197	108,596	0	108,596	108,664	0	108,664	108,566	0	108,566	106,068	52,145	158,213
9	MD295-.60 MI S OF MD197	114,712	0	114,712	114,373	0	114,373	114,371	0	114,371	110,520	52,145	162,665
10	MD295-.40 MI N OF MD193	97,096	0	97,096	98,078	0	98,078	97,554	0	97,554	97,685	42,258	139,943
11	MD295-.30 MI N OF IS95	109,023	0	109,023	113,433	0	113,433	112,008	0	112,008	108,756	42,258	151,014
12	MD295-.30 MI S OF IS95	96,911	0	96,911	93,292	0	93,292	94,997	0	94,997	89,706	32,081	121,787
13	MD295-.20 MI N OF MD450	96,620	0	96,620	93,564	0	93,564	95,229	0	95,229	96,035	22,533	118,568
14	MD295-.20 MI N OF MD202	109,058	0	109,058	104,952	0	104,952	107,014	0	107,014	104,971	22,533	127,504
15	MD295-.50 MI N OF US50	111,094	0	111,094	106,689	0	106,689	108,689	0	108,689	100,755	22,533	123,288

Table B6. 2040 Simulated AAWDT Volumes on I-270 / I-495 / MD 295; % Differences Relative to Alternative 1 (No Build)

I-270 Locations

Seq#	Location	Alternative 1			Alternative 2			Alternative 3			Alternative 4		
		GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total
1	IS270-.40 MI S OF NEW DESIGN RD	N/A	N/A	N/A	0%	N/A	0%	0%	N/A	0%	1%	N/A	12%
2	IS270-.20 MI S OF BAKER VALLEY RD	N/A	N/A	N/A	0%	N/A	0%	0%	N/A	0%	-4%	N/A	22%
3	IS270-50ft S OF FREDERICK CO/L	N/A	N/A	N/A	0%	N/A	0%	0%	N/A	0%	-6%	N/A	23%
4	IS270-.50 MI N OF MD121	N/A	N/A	N/A	0%	N/A	0%	0%	N/A	0%	-8%	N/A	25%
5	IS 270 South of MD 121 (ATR#04)	N/A	N/A	N/A	0%	1%	0%	0%	1%	0%	-10%	556%	14%
6	IS270-.40 MI N OF MD118	N/A	N/A	N/A	0%	2%	0%	0%	1%	0%	-12%	652%	12%
7	IS270-.30 MI S OF MD118	N/A	N/A	N/A	0%	1%	0%	0%	1%	0%	-11%	579%	10%
8	IS270-.50 MI S OF MIDDLEBROOK RD	N/A	N/A	N/A	0%	1%	0%	0%	1%	0%	-10%	579%	8%
9	IS270-.30 MI S OF MD124	N/A	N/A	N/A	0%	3%	0%	-1%	2%	0%	-7%	474%	6%
10	IS270-.50 MI N OF IS370	N/A	N/A	N/A	-3%	74%	0%	-2%	42%	-1%	-5%	246%	5%
11	IS270-.30 MI N OF SHADY GROVE RD	N/A	N/A	N/A	-4%	125%	2%	-5%	45%	-3%	-7%	207%	2%
12	IS270-.50 MI N OF MD28	N/A	N/A	N/A	-7%	229%	2%	-7%	103%	-3%	-8%	243%	2%
13	IS270-.30 MI S OF MD28	N/A	N/A	N/A	-7%	229%	1%	-7%	103%	-3%	-7%	243%	1%
14	IS270-.30 MI N OF MD927 (MONTROSE RD)	N/A	N/A	N/A	-7%	213%	1%	-7%	93%	-3%	-7%	226%	1%
15	IS270-.10 MI N OF TUCKERMAN LA	N/A	N/A	N/A	-10%	239%	1%	-9%	114%	-4%	-10%	257%	1%
16	IS270Y-.30 MI N OF WESTLAKE TERR	N/A	N/A	N/A	-12%	174%	-1%	-11%	91%	-5%	-12%	182%	-1%
17	IS270Y-.40 MI S OF DEMOCRACY BLVD	N/A	N/A	N/A	-18%	252%	-3%	-18%	143%	-8%	-18%	276%	-1%
18	IS270-.30 MI N OF MD187B	N/A	N/A	N/A	-7%	508%	4%	-7%	207%	-2%	-7%	563%	4%
19	IS270-.10 MI S OF MD187	N/A	N/A	N/A	-4%	553%	9%	-4%	230%	1%	-4%	613%	10%

I-495 Locations

Seq#	Location	Alternative 1			Alternative 2			Alternative 3			Alternative 4		
		GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total
1	IS495-.10 MI E OF PERSIMMON TREE RD	N/A	N/A	N/A	-3%	N/A	19%	-1%	N/A	11%	-3%	N/A	21%
2	IS495-.70 MI N OF MD190	N/A	N/A	N/A	-4%	N/A	12%	-4%	N/A	6%	-4%	N/A	14%
3	IS495-.50 MI W OF MD187	N/A	N/A	N/A	-5%	N/A	32%	2%	N/A	25%	-3%	N/A	34%
4	IS495-.30 MI E OF MD187	N/A	N/A	N/A	-6%	N/A	33%	0%	N/A	23%	-3%	N/A	35%
5	IS495-.20 MI E OF MD355	N/A	N/A	N/A	-2%	N/A	26%	-1%	N/A	15%	-1%	N/A	27%
6	IS495-.80 MI W OF MD97	N/A	N/A	N/A	-2%	N/A	26%	-1%	N/A	15%	-1%	N/A	28%
7	IS495-.20 MI E OF MD97	N/A	N/A	N/A	0%	N/A	25%	0%	N/A	15%	1%	N/A	26%
8	IS495-.20 MI E OF US29	N/A	N/A	N/A	-2%	N/A	23%	-2%	N/A	14%	-1%	N/A	26%
9	IS 495 West of MD 650 (ATR#41)	N/A	N/A	N/A	-2%	N/A	21%	-2%	N/A	13%	-1%	N/A	24%
10	IS495-.10 MI W OF MD212	N/A	N/A	N/A	-1%	N/A	19%	-1%	N/A	11%	-1%	N/A	21%
11	IS95-.30 MI N OF US1	N/A	N/A	N/A	-11%	N/A	-1%	-8%	N/A	-1%	-9%	N/A	1%
12	IS95-.40 MI S OF US1	N/A	N/A	N/A	-3%	N/A	7%	-2%	N/A	5%	-4%	N/A	7%
13	IS95-.30 MI N OF MD201	N/A	N/A	N/A	-7%	N/A	8%	-4%	N/A	6%	-7%	N/A	8%
14	IS95-.30 MI S OF MD201	N/A	N/A	N/A	-6%	N/A	9%	-4%	N/A	6%	-6%	N/A	9%
15	IS 95 North of Good Luck Rd (ATR#55)	N/A	N/A	N/A	-4%	N/A	12%	-2%	N/A	8%	-3%	N/A	14%
16	IS95-.60 MI N OF IS595/US50	N/A	N/A	N/A	-4%	N/A	11%	-3%	N/A	7%	-3%	N/A	14%
17	IS95-.10 MI S OF MD704	N/A	N/A	N/A	-5%	N/A	14%	-3%	N/A	8%	-5%	N/A	14%
18	IS95-.40 MI S OF MD202	N/A	N/A	N/A	-1%	N/A	13%	-1%	N/A	8%	-1%	N/A	14%
19	IS 95 South of MD 214 (ATR#43)	N/A	N/A	N/A	-3%	N/A	12%	-1%	N/A	9%	-3%	N/A	13%
20	IS95-.50 MI N OF MD4	N/A	N/A	N/A	-2%	N/A	10%	-2%	N/A	7%	-2%	N/A	11%
21	IS95-.40 MI S OF MD4	N/A	N/A	N/A	-4%	N/A	8%	-3%	N/A	7%	-4%	N/A	9%
22	IS95-.40 MI N OF MD5	N/A	N/A	N/A	-6%	N/A	8%	-5%	N/A	6%	-6%	N/A	8%
23	IS 95 at Temple Hill Rd (ATR#49)	N/A	N/A	N/A	-5%	N/A	3%	-4%	N/A	3%	-5%	N/A	3%
24	IS95-.40 MI S OF MD414	N/A	N/A	N/A	-6%	N/A	2%	-4%	N/A	2%	-6%	N/A	2%
25	IS95-.30 MI S OF MD210	N/A	N/A	N/A	-1%	N/A	-1%	0%	N/A	0%	-1%	N/A	-1%
26	IS95-.50 MI N OF VIRGINIA ST/L	N/A	N/A	N/A	-2%	N/A	-2%	-1%	N/A	-1%	-2%	N/A	-2%

MD 295 Locations

Seq#	Location	Alternative 1			Alternative 2			Alternative 3			Alternative 4		
		GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total	GPL	HOV/ETL	Total
1	MD295-.10 MI S OF BALTIMORE CO/L	N/A	N/A	N/A	0%	N/A	0%	0%	N/A	0%	0%	N/A	0%
2	MD295-.20 MI S OF IS695	N/A	N/A	N/A	0%	N/A	0%	0%	N/A	0%	-16%	N/A	26%
3	MD295-.60 MI N OF IS195	N/A	N/A	N/A	-1%	N/A	-1%	0%	N/A	0%	-16%	N/A	26%
4	MD295-.30 MI N OF MD100	N/A	N/A	N/A	1%	N/A	1%	1%	N/A	1%	-9%	N/A	36%
5	MD295-.60 MI S OF MD100	N/A	N/A	N/A	0%	N/A	0%	0%	N/A	0%	-7%	N/A	35%
6	MD295-.25 MI S OF MD175	N/A	N/A	N/A	0%	N/A	0%	0%	N/A	0%	-4%	N/A	39%
7	MD295-.50 MI S OF MD32	N/A	N/A	N/A	0%	N/A	0%	0%	N/A	0%	-4%	N/A	40%
8	MD295-.30 MI N OF MD197	N/A	N/A	N/A	0%	N/A	0%	0%	N/A	0%	-2%	N/A	46%
9	MD295-.60 MI S OF MD197	N/A	N/A	N/A	0%	N/A	0%	0%	N/A	0%	-4%	N/A	42%
10	MD295-.40 MI N OF MD193	N/A	N/A	N/A	1%	N/A	1%	0%	N/A	0%	1%	N/A	44%
11	MD295-.30 MI N OF IS95	N/A	N/A	N/A	4%	N/A	4%	3%	N/A	3%	0%	N/A	39%
12	MD295-.30 MI S OF IS95	N/A	N/A	N/A	-4%	N/A	-4%	-2%	N/A	-2%	-7%	N/A	26%
13	MD295-.20 MI N OF MD450	N/A	N/A	N/A	-3%	N/A	-3%	-1%	N/A	-1%	-1%	N/A	23%
14	MD295-.20 MI N OF MD202	N/A	N/A	N/A	-4%	N/A	-4%	-2%	N/A	-2%	-4%	N/A	17%
15	MD295-.50 MI N OF US50	N/A	N/A	N/A	-4%	N/A	-4%	-2%	N/A	-2%	-9%	N/A	11%

National Capital Region
Transportation Planning Board

MEMORANDUM

TO: Kari Snyder, MDOT Staff

FROM: Dusan Vuksan, Feng Xie, TPB Staff

SUBJECT: 2045 Sensitivity Analysis of TRP-Related Projects in Visualize 2045

DATE: January 11, 2019

CC: Kanti Srikanth, Tim Canan, Mark Moran, Jinchul Park, TPB Staff

INTRODUCTION

The Maryland Department of Transportation (MDOT) has requested Transportation Planning Board (TPB) staff's assistance in an analysis to better understand the impact of Maryland's Traffic Relief Plan (TRP) projects (as specified in the Visualize 2045 Plan) on regional travel demand, performance and emissions. As specified in the Scope of Work for the project, the analysis assesses how the TRP-related projects included in the Visualize 2045 Plan will affect the performance of the Washington, D.C. region's transportation system, such as vehicle-hours-of-delay (VHD), vehicle-miles-traveled (VMT), and mobile source emissions. A preliminary memorandum documenting the 2030 analysis was provided to MDOT on December 21, 2018. This preliminary technical memorandum documents the impacts of TRP-related projects on overall system performance in 2045.

ALTERNATIVES

MDOT is interested in examining the changes in the region's transportation system performance that can reasonably be attributed to the TRP-related projects in Visualize 2045. This would require a "before/after" or "Build/No Build" analysis of the TRP-related projects. Typically, regional, sub-regional and scenario planning studies use the Metropolitan Planning Organization's (MPO) long-range plan forecasts as a "baseline" or "no build" option. However, in this case, the TPB's long-range plan (Visualize 2045) already includes the TRP and as such will serve as an "After" or "Build" alternative. Staff's technical analysis has developed a "Before" or "No Build" alternative by removing only the TRP-related projects from the existing network inputs [1] to the travel demand model. Other future year Visualize 2045 constrained element projects are included in both "No Build" and "Build" scenarios (i.e., US 301 expansion is included in "No Build" and "Build" in this context).

MDOT has also requested that the impacts of the TRP-related projects be examined in years 2030 and 2045. The complete list of alternatives that are being examined as part of this "study" are

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[1] As part of Visualize 2045, the Virginia Department of Transportation (VDOT) modified the extension of the Virginia Beltway HOT Lanes to coordinate with the Maryland TRP project. In Visualize 2045, VDOT assumed two HOT lanes in each direction from George Washington Parkway to the American Legion Bridge to match the proposed managed lane configuration in Maryland. The prior 2016 Constrained Long Range Plan assumed one lane per direction in this section. In addition to removing the TRP project in Maryland, "No Build" scenario reverts to one managed lane in each direction for this segment of Beltway in Virginia.

shown in Table 1. This memorandum summarizes the system performance for TRP No Build and TRP Build scenarios for the analysis year 2045 (shown in red in Table 1).

Table 1. Alternatives for Analysis

	TRP "No Build"	TRP "Build"
2030	Completed	Completed for Visualize 2045
2045	**Completed**	Completed for Visualize 2045

It is important to note that this effort is not part of the ongoing MDOT I-495 and I-270 Managed Lanes project development studies. These sensitivity tests are being done to quantify the estimates of potential system performance improvements of the TRP-related projects. Such information will help MDOT with the project's stakeholders' outreach. Additionally, this analysis does not attempt to analyze or recommend specific TRP alternatives.

The TRP-related projects in Visualize 2045, assumed in TRP Build scenario, are as follows:

- Two additional managed lanes in each direction on Capital Beltway/I-495 in Maryland
- Two additional managed lanes in each direction on I-270 (including the Spurs) from the Beltway to I-70; the existing I-270 HOV lanes are not removed nor converted to other types of managed lanes
- Direct-access points are constructed at key locations

Project descriptions for I-495 and I-270 Managed Lanes are included in Appendix A of this memorandum.

ANALYSIS METHODOLOGY

The 2045 TRP No Build alternative was modeled using the TPB's typical modeling process, which was also applied to the 2045 TRP Build alternative as a part of the Visualize 2045 analysis. The methodology includes:

- Toll development process [2]
- Final travel demand model run with newly developed tolls
- MOVES mobile emissions runs

As this study or "test" has been designed to assess the TRP impacts regionally, and not at the link level, detailed base-year model validation was not conducted. The transportation performance and greenhouse gas impacts are assessed for the TPB Planning Area, while the nitrogen oxide (NOx) and volatile organic compounds (VOCs) are analyzed for the 8-Hour Ozone Nonattainment Area (as depicted on Map 1).

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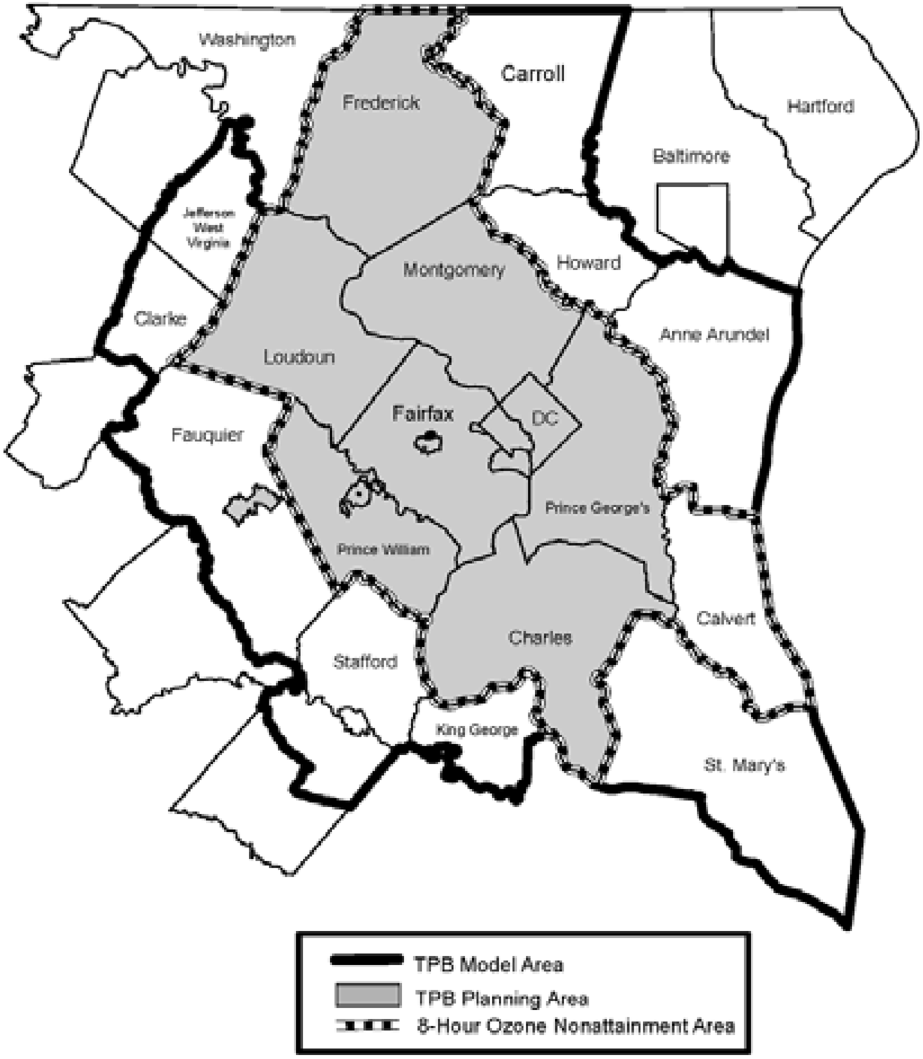
[2] Although TRP's tolled facilities were removed from the analysis in TRP No Build alternative, the toll development process was performed for the Virginia facilities as their toll rates could be impacted when the TRP-related managed lane facilities in Maryland are removed from the transportation networks.

Map 1. TPB Planning Area



MODEL INPUTS AND VERSION

The analysis model is the current model of record, which is the TPB Version 2.3.75 travel demand model with the Round 9.1 Cooperative Forecasts of land activity, the transportation inputs for the constrained element of the Visualize 2045 Long Range Plan and the alternative-specific inputs discussed in the “Alternatives” section of this memorandum (where applicable). Consistent with the Visualize 2045 analysis, mobile emissions analysis was conducted using the EPA’s MOVES2014a model.

2045 ANALYSIS YEAR SUMMARY FINDINGS

In general, the TRP projects appear to help improve mobility, accessibility, reliability, and reduce congestion. Specifically, of all the performance measures that were evaluated, the analysis shows that congestion reduction and reliability will experience the greatest gains resulting from the implementation of system of managed lanes. On the other hand, TRP projects are forecast to have less of an impact on emissions, with two of the three pollutants analyzed in this technical report forecast to increase slightly. These findings are all in line with the 2030 analysis that was provided to MDOT in December 2018.

Specifically, the number and share of HOV trips will increase, while SOV and transit will decrease for both work and all daily trips. VMT will increase while vehicle hours of delay (VHD) will decrease. Similarly, the number of lane miles that are congested will decrease, as will the proportion of congested lane miles. Person miles traveled (PMT) will increase, while PMT on reliable modes of travel will increase. Average number of jobs accessible within 45 minutes of travel by auto and transit will increase. The magnitude of change across the various performance measures varies and will need to be assessed relative to the base value of the specific performance measure.

TRANSPORTATION SYSTEM PERFORMANCE

The regional-level transportation system performance findings of the 2045 TRP sensitivity test are summarized below for the TPB Planning Area. The summaries highlight impacts of the TRP-related projects on the transportation system in 2045 (as “2045 TRP Build minus 2045 TRP No Build” comparisons).

It is important to note that the summaries presented in this memorandum are based on a regional travel demand model that was not specifically validated against observed data for the TRP study area. For example, link-level simulated volumes on I-270 were not compared against observed counts. This was determined acceptable for this study since the results are being examined at the regional level, and the model has previously been calibrated and validated at the regional and screen-line levels. As such, the findings of this analysis would not be applicable to individual roadways and smaller area geographies without a reevaluation of the model validation.

Also, as the changes in estimates of various performance measures are examined, it should be noted that those performance measures that are designed to respond to changes in land use do not change, since the land use assumptions in this analysis for Build and No Build scenarios were not changed.

MODE CHOICE

Tables 2a and 2b display mode shifts resulting from the implementation of TRP in 2045. They show that the TRP facilities mainly impact the commute trips, which largely occur in peak periods. **For both the commute and all trip purposes, HOV/Carpool mode benefits the most from the system of**

managed lanes, while transit and SOV person trips decline in TRP Build scenario. All users have to pay to access managed lanes, but commuting carpools have a large value of time, which explains the shift from other modes to carpooling in TRP Build (i.e., tolls are not as significant when three-person work carpool participants share the costs associated with tolls). However, it is important to be cognizant of the scale of magnitude of change. In many instances, the percent difference between Build and No Build is close to zero, especially for all trip purposes shown in Table 2b, even when the absolute change in measurable.

Table 2a. Mode Choice for <u>Commute</u> Trips in 2045

	TRP No Build	TRP Build	Difference	% Diff.
Commute Trips	4,143,400	4,142,600	-800	0%
SOV	2,333,100	2,324,000	-9,100	0%
HOV/Carpool	421,600	444,600	23,000	5%
Transit	1,121,100	1,106,300	-14,800	-1%
Non-Motorized	267,700	267,600	-100	0%

Table 2b. Mode Choice for <u>All Trip Purposes</u> in 2045

	TRP No Build	TRP Build	Difference	% Diff.
All Trips	20,823,200	20,819,600	-3,600	0%
SOV	7,929,400	7,917,500	-11,900	0%
HOV/Carpool	8,199,600	8,224,000	24,400	0%
Transit	1,565,800	1,550,300	-15,500	-1%
Non-Motorized	3,128,400	3,127,900	-500	0%

<u>VMT AND CONGESTION</u>

Table 3 displays the effects of the TRP-related projects on vehicular travel and congestion on the region's roadway system. As can be seen, the implementation of **the TRP managed lane system results in a 1% increase in daily vehicle miles traveled (VMT). In addition, two important congestion indicators, daily vehicle hours of delay (VHD) and AM peak lane miles of congestion, decrease by 11% and 7%, respectively,** relative to TRP No Build.

Table 3. Vehicle Miles Traveled and Congestion in 2045

	TRP No Build	TRP Build	Difference	% Diff.
Average Weekday Measures				
VMT	144,171,000	145,597,000	1,426,000	1%
VHD	1,940,000	1,729,000	-211,000	-11%
AM Peak Measures				
Lane Miles of Congestion	2,900	2,700	-200	-7%
Peak Hour % Congested Lane Miles	16.1%	14.4%	-1.7%	N/A

TRANSPORTATION SYSTEM RELIABILITY

Table 4 below examines the transportation system reliability in TRP No Build and TRP Build scenarios. Consistent with the Visualize 2045 performance analysis, system reliability is defined as percentage of person miles traveled (PMT) on reliable travel modes [3]**. Since the TRP managed lanes facilities are categorized as a "reliable mode," construction and implementation of the TRP-related projects were expected to improve the system reliability. Consequently, PMT on reliable modes in TRP Build increases by 20%** relative to TRP No Build, and percentage of PMT on reliable modes increases from 12.9% to 15.3%.

Table 4. Transportation System Reliability in 2045

	TRP No Build	TRP Build	Difference	% Diff.
System Person Miles Traveled (PMT)	213,862,000	216,471,000	2,609,000	1%
PMT on Reliable Modes	27,671,000	33,148,000	5,477,000	20%
Percentage of PMT on Reliable Modes	12.9%	15.3%	2.4%	

ACCESSIBILITY

Table 5 examines the change in average system accessibility that can be attributed to the TRP projects. In this analysis, accessibility is measured as **average number of jobs that can be accessed** in AM Peak within 45 minutes by auto or transit. As shown in Table 5, **the average auto accessibility increases by 5% and the average transit accessibility increases by 1% in** TRP Build scenario.

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[3] Reliable modes refer to express toll lanes with dynamic toll rates (HOT/ETL), HOV lanes, ICC, Dulles Airport Access Road, Fixed Guide-way Transit (Metrorail, Commuter Rail, Light Rail, Streetcar), Bus Rapid Transit, long-haul express buses, and non-motorized travel (bike/pedestrian).

Table 5. Average Number of Jobs Accessible in AM Peak Period within 45 minutes in 2045

	TRP No Build	TRP Build	Difference	% Diff.
Average Auto Accessibility	866,000	909,000	43,000	5%
Average Transit Accessibility	514,000	518,000	3,000	1%

MOBILE EMISSIONS

Emissions estimates for the two 2045 scenarios are summarized in Table 6 for the ozone season pollutants and greenhouse gases. While VOC emissions are estimated to decrease (slightly), NOx and CO2 (GHG) emissions are estimated to increase slightly.

Table 6. Emissions Estimates in 2030

	Pollutant	TRP No Build	TRP Build	Difference	% Diff.
Ozone Season	VOC (tons/day)	18.396	18.393	-0.003	0.0%
	NOx (tons/day)	19.395	19.527	0.132	0.7%
Greenhouse Gases	GHG (metric tons of CO2 Equivalent/year)	17,404,249	17,482,572	78,323	0.5%

NEXT STEPS

Staff have completed the 2045 analysis and documented the draft findings in this memorandum. Final technical memorandum for the study will be completed at the end of January. The major tasks related to this study, shared in the Scope of Work, are specified below.

- December 14, 2019: 2030 Evaluation / Preliminary Memorandum; COMPLETE
- January 18, 2019: 2045 Evaluation / Preliminary Memorandum; COMPLETE
- January 31, 2019: Final Memorandum

APPENDIX A

VISUALIZE 2045
PROJECT DESCRIPTIONS
FOR I-270 AND I-495

I-270 MANAGED LANES

PROPOSED MAJOR ADDITION
VISUALIZE 2045

From I-495, Capital Beltway to I-70/US 40

Basic Project Information

Project Length..34 Miles

Anticipated Completion.............................2020-2025*

Estimated Cost of Construction..................$4 billion

Submitting Agency....................................Maryland DOT

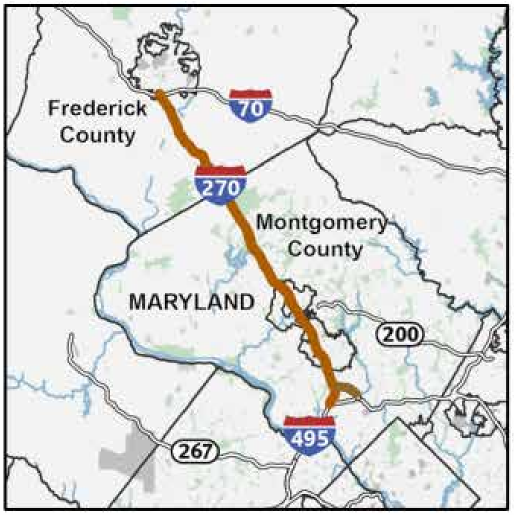
Anticipated Funding Sources..

☐ Federal ☐ State ☐ Local ☒ **Private** ☐ Bonds ☐ Other

CEID...1186

HIGHWAY TRANSIT BICYCLE OR PEDESTRIAN

FINAL COMMENT PERIOD
September 7 – October 7, 2018
See reverse for details, or visit www.mwcog.org/TPBcomment.



Project Description

The I-270 component of MDOT's "Traffic Relief Plan" project will add two new managed lanes in each direction along I-270 between the Capital Beltway (I-495) and I-70/US 40.

*Actual completion year will depend on awarded contract. For air quality conformity modeling purposes, the completion date is presumed to be 2025.

Existing Support for this Project

This project has undergone review at the local, state, and/or sub-regional levels and is included in the following approved plans:

☒ Montgomery County 2017 Transportation Priority Letter

☒ MDOT/SHA Traffic Relief Plan

See official Visualize 2045 Project Description Form for more information about this project.

Goal 1: *Provide a Range of Transportation Options*

Goal 2: *Promote Dynamic Activity Centers*

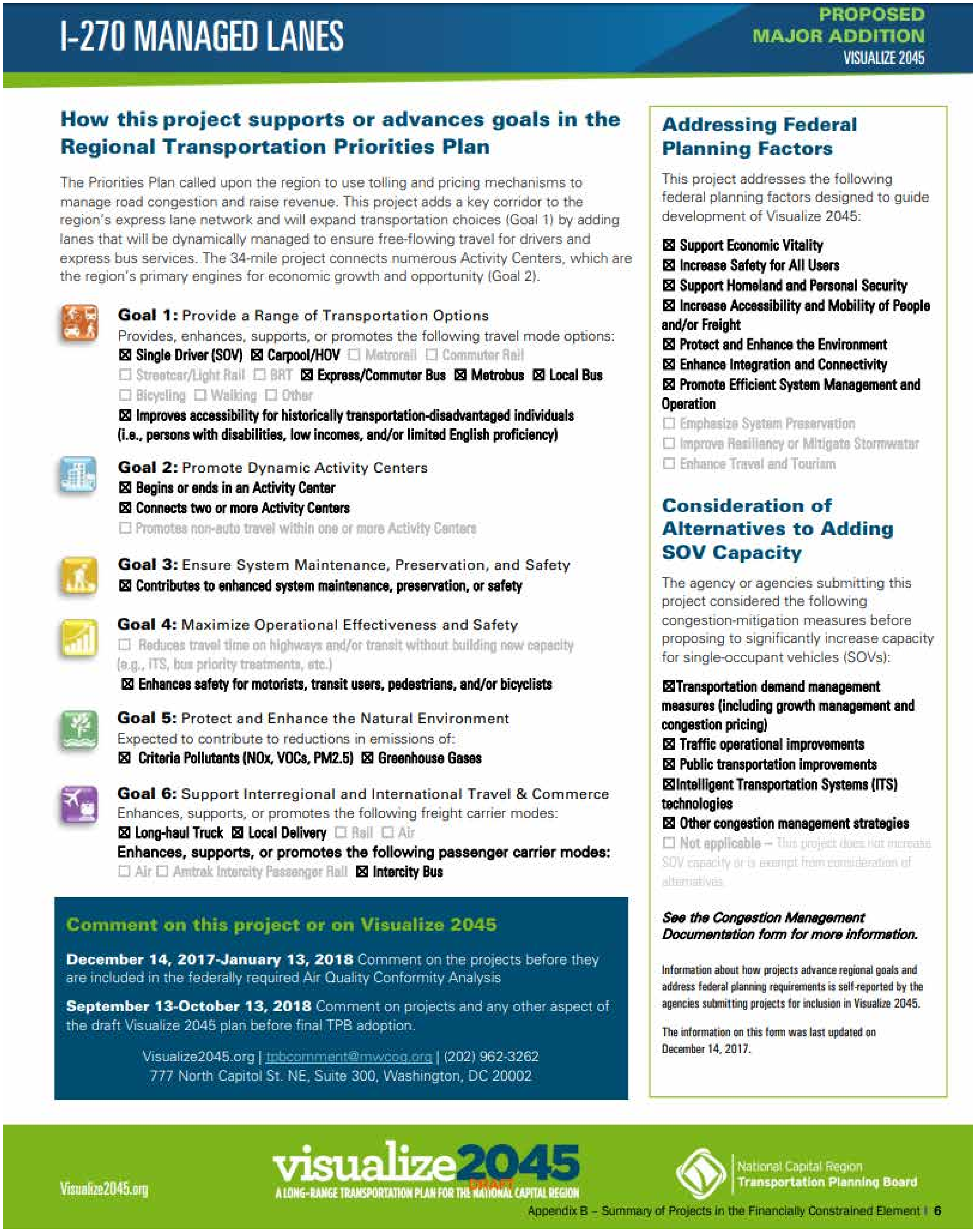
Goal 3: *Ensure System Maintenance, Preservation, and Safety*

Goal 4: *Maximize Operational Effectiveness and Safety*

Goal 5: *Protect and Enhance the Natural Environment*

Goal 6: *Support Interregional and International Travel and Commerce*

See reverse side for more information about how this project advances regional goals and addresses certain federal planning requirements.



I-270 MANAGED LANES

PROPOSED MAJOR ADDITION
VISUALIZE 2045

How this project supports or advances goals in the Regional Transportation Priorities Plan

The Priorities Plan called upon the region to use tolling and pricing mechanisms to manage road congestion and raise revenue. This project adds a key corridor to the region's express lane network and will expand transportation choices (Goal 1) by adding lanes that will be dynamically managed to ensure free-flowing travel for drivers and express bus services. The 34-mile project connects numerous Activity Centers, which are the region's primary engines for economic growth and opportunity (Goal 2).

Goal 1: Provide a Range of Transportation Options
Provides, enhances, supports, or promotes the following travel mode options:
☒ **Single Driver (SOV)** ☒ **Carpool/HOV** ☐ Metrorail ☐ Commuter Rail
☐ Streetcar/Light Rail ☐ BRT ☒ **Express/Commuter Bus** ☒ **Metrobus** ☒ **Local Bus**
☐ Bicycling ☐ Walking ☐ Other
☒ **Improves accessibility for historically transportation-disadvantaged individuals (i.e., persons with disabilities, low incomes, and/or limited English proficiency)**

Goal 2: Promote Dynamic Activity Centers
☒ **Begins or ends in an Activity Center**
☒ **Connects two or more Activity Centers**
☐ Promotes non-auto travel within one or more Activity Centers

Goal 3: Ensure System Maintenance, Preservation, and Safety
☒ **Contributes to enhanced system maintenance, preservation, or safety**

Goal 4: Maximize Operational Effectiveness and Safety
☐ Reduces travel time on highways and/or transit without building new capacity (e.g., ITS, bus priority treatments, etc.)
☒ **Enhances safety for motorists, transit users, pedestrians, and/or bicyclists**

Goal 5: Protect and Enhance the Natural Environment
Expected to contribute to reductions in emissions of:
☒ **Criteria Pollutants (NOx, VOCs, PM2.5)** ☒ **Greenhouse Gases**

Goal 6: Support Interregional and International Travel & Commerce
Enhances, supports, or promotes the following freight carrier modes:
☒ **Long-haul Truck** ☒ **Local Delivery** ☐ Rail ☐ Air
Enhances, supports, or promotes the following passenger carrier modes:
☐ Air ☐ Amtrak Intercity Passenger Rail ☒ **Intercity Bus**

Comment on this project or on Visualize 2045

December 14, 2017-January 13, 2018 Comment on the projects before they are included in the federally required Air Quality Conformity Analysis

September 13-October 13, 2018 Comment on projects and any other aspect of the draft Visualize 2045 plan before final TPB adoption.

Visualize2045.org | tpbcomment@mwcog.org | (202) 962-3262
777 North Capitol St. NE, Suite 300, Washington, DC 20002

Addressing Federal Planning Factors

This project addresses the following federal planning factors designed to guide development of Visualize 2045:

☒ **Support Economic Vitality**
☒ **Increase Safety for All Users**
☒ **Support Homeland and Personal Security**
☒ **Increase Accessibility and Mobility of People and/or Freight**
☒ **Protect and Enhance the Environment**
☒ **Enhance Integration and Connectivity**
☒ **Promote Efficient System Management and Operation**
☐ Emphasize System Preservation
☐ Improve Resiliency or Mitigate Stormwater
☐ Enhance Travel and Tourism

Consideration of Alternatives to Adding SOV Capacity

The agency or agencies submitting this project considered the following congestion-mitigation measures before proposing to significantly increase capacity for single-occupant vehicles (SOVs):

☒**Transportation demand management measures (including growth management and congestion pricing)**
☒ **Traffic operational improvements**
☒ **Public transportation improvements**
☒**Intelligent Transportation Systems (ITS) technologies**
☒ **Other congestion management strategies**
☐ **Not applicable** – This project does not increase SOV capacity or is exempt from consideration of alternatives.

See the Congestion Management Documentation form for more information.

Information about how projects advance regional goals and address federal planning requirements is self-reported by the agencies submitting projects for inclusion in Visualize 2045.

The information on this form was last updated on December 14, 2017.

Visualize2045.org

visualize2045 DRAFT
A LONG-RANGE TRANSPORTATION PLAN FOR THE NATIONAL CAPITAL REGION

National Capital Region Transportation Planning Board

I-495 MANAGED LANES

PROPOSED MAJOR ADDITION
VISUALIZE 2045

From the American Legion Bridge to the Woodrow Wilson Bridge

Basic Project Information

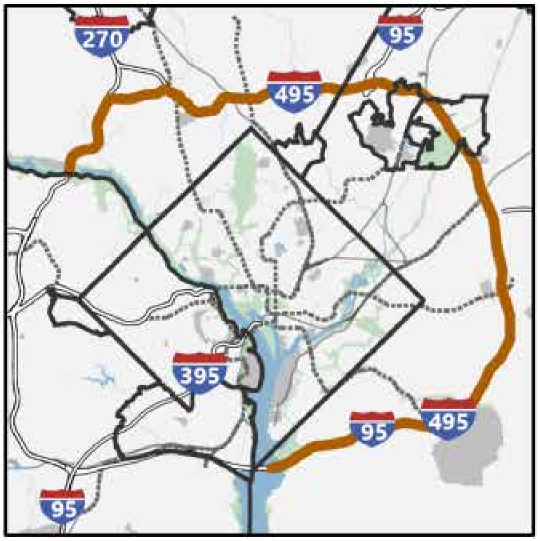
Project Length	22 Miles
Anticipated Completion	2020-2025*
Estimated Cost of Construction	$4.2 billion
Submitting Agency	Maryland DOT
Anticipated Funding Sources	

☐ Federal ☐ State ☐ Local ☒ **Private** ☐ Bonds ☐ Other

CEID	1182, 3281

HIGHWAY TRANSIT BICYCLE OR PEDESTRIAN

FINAL COMMENT PERIOD
September 7 – October 7, 2018
See reverse for details, or visit www.mwcog.org/TPBcomment.



Project Description

The I-495 component of MDOT's "Traffic Relief Plan" project will add two new managed lanes in each direction along the Capital Beltway between the Virginia end of the American Legion Bridge to the Maryland end of the Woodrow Wilson Bridge.

*Actual completion year will depend on awarded contract. For air quality conformity modeling purposes, the completion date is presumed to be 2025.

Existing Support for this Project

This project has been reviewed at the local, state, and/or sub-regional levels and is included in the following approved plans:

☒ Montgomery County 2017 Transportation Priority Letter

☒ 2009 Prince George's County Master Plan of Transportation (MPO

☒ 1990 Heights Sector Plan

See official Visualize 2045 Project Description Form for more information about this project.

Goal 1: *Provide a Range of Transportation Options*

Goal 2: *Promote Dynamic Activity Centers*

Goal 3: *Ensure System Maintenance, Preservation, and Safety*

Goal 4: *Maximize Operational Effectiveness and Safety*

Goal 5: *Protect and Enhance the Natural Environment*

Goal 6: *Support Interregional and International Travel and Commerce*

See reverse side for more information about how this project advances regional goals and addresses certain federal planning requirements.

I-495 MANAGED LANES

PROPOSED MAJOR ADDITION
VISUALIZE 2045

How this project supports or advances goals in the Regional Transportation Priorities Plan

New managed lanes on the entire 42-mile length of Maryland's Capital Beltway will dramatically expand transportation choices (Goal 1) in the region by adding dynamically managed lanes to ensure free-flowing travel for drivers and for express bus services. Along with the I-270 Managed Lanes, this project significantly expands the region's network of recent and forthcoming priced-lane projects. The project will connect numerous Activity Centers (Goal 2), the region's focal points for economic growth.

Goal 1: Provide a Range of Transportation Options

Provides, enhances, supports, or promotes the following travel mode options:

☒ **Single Driver (SOV)** ☒ **Carpool/HOV** ☐ Metrorail ☐ Commuter Rail
☐ Streetcar/Light Rail ☐ BRT ☒ **Express/Commuter Bus** ☒ **Metrobus** ☒ **Local Bus**
☐ Bicycling ☐ Walking ☐ Other

☒ **Improves accessibility for historically transportation-disadvantaged individuals (i.e., persons with disabilities, low incomes, and/or limited English proficiency)**

Goal 2: Promote Dynamic Activity Centers

☒ **Begins or ends in an Activity Center**
☒ **Connects two or more Activity Centers**
☐ Promotes non-auto travel within one or more Activity Centers

Goal 3: Ensure System Maintenance, Preservation, and Safety

☒ **Contributes to enhanced system maintenance, preservation, or safety**

Goal 4: Maximize Operational Effectiveness and Safety

☐ Reduces travel time on highways and/or transit without building new capacity (e.g., ITS, bus priority treatments, etc.)
☒ **Enhances safety for motorists, transit users, pedestrians, and/or bicyclists**

Goal 5: Protect and Enhance the Natural Environment

Expected to contribute to reductions in emissions of:

☒ **Criteria Pollutants (NOx, VOCs, PM2.5)** ☒ **Greenhouse Gases**

Goal 6: Support Interregional and International Travel and Commerce

Enhances, supports, or promotes the following freight carrier modes:

☒ **Long-haul Truck** ☒ **Local Delivery** ☐ Rail ☐ Air

Enhances, supports, or promotes the following passenger carrier modes:

☐ Air ☐ Amtrak Intercity Passenger Rail ☒ **Intercity Bus**

Comment on this project or on Visualize 2045

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☒ **Protect and Enhance the Environment**
☒ **Enhance Integration and Connectivity**
☒ **Promote Efficient System Management and Operation**
☐ Emphasize System Preservation
☐ Improve Resiliency or Mitigate Stormwater
☐ Enhance Travel and Tourism

Consideration of Alternatives to Adding SOV Capacity

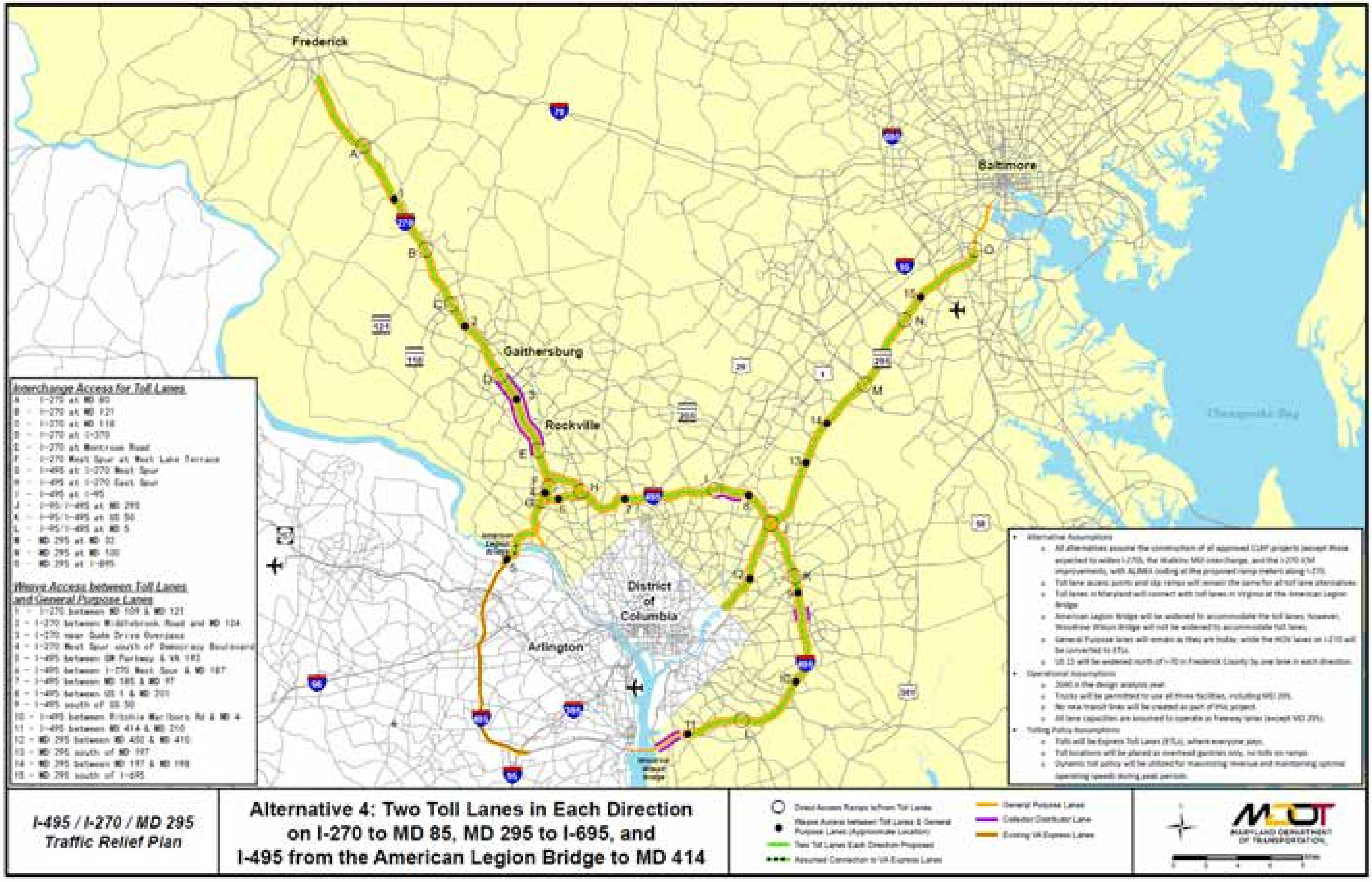
The agency or agencies submitting this project considered the following congestion-mitigation measures before proposing to significantly increase capacity for single-occupant vehicles (SOVs):

☒**Transportation demand management measures (including growth management and congestion pricing)**
☒ **Traffic operational improvements**
☒ **Public transportation improvements**
☒**Intelligent Transportation Systems (ITS) technologies**
☒ **Other congestion management strategies**
☐ **Not applicable** – This project does not increase SOV capacity or is exempt from consideration of alternatives.

See the Congestion Management Documentation form for more information.

Information about how projects advance regional goals and address federal planning requirements is self-reported by the agencies submitting projects for inclusion in Visualize 2045.

The information on this form was last updated on December 14, 2017.



Interchange Access for Toll Lanes

A - I-270 at MD 85
B - I-270 at MD 121
C - I-270 at MD 118
D - I-270 at I-370
E - I-270 at Montrose Road
F - I-270 West Spur at West Lake Terrace
G - I-495 at I-270 West Spur
H - I-495 at I-270 East Spur
I - I-495 at I-95
J - I-95/I-495 at MD 295
K - I-95/I-495 at US 50
L - I-95/I-495 at MD 5
M - MD 295 at MD 32
N - MD 295 at MD 100
O - MD 295 at I-695

Weave Access between Toll Lanes and General Purpose Lanes

1 - I-270 between MD 109 & MD 121
2 - I-270 between Middlebrook Road and MD 124
3 - I-270 near Gude Drive Overpass
4 - I-270 West Spur south of Democracy Boulevard
5 - I-495 between GW Parkway & VA 193
6 - I-495 between I-270 West Spur & MD 187
7 - I-495 between MD 185 & MD 97
8 - I-495 between US 1 & MD 201
9 - I-495 south of US 50
10 - I-495 between Ritchie Marlboro Rd & MD 4
11 - I-495 between MD 414 & MD 210
12 - MD 295 between MD 450 & MD 410
13 - MD 295 south of MD 197
14 - MD 295 between MD 197 & MD 198
15 - MD 295 south of I-695

- Alternative Assumptions
  - All alternatives assume the construction of all approved CLRP projects (except those expected to widen I-270), the Watkins Mill interchange, and the I-270 ICM improvements, with ALINEA coding at the proposed ramp meters along I-270.
  - Toll lane access points and slip ramps will remain the same for all toll lane alternatives.
  - Toll lanes in Maryland will connect with toll lanes in Virginia at the American Legion Bridge.
  - American Legion Bridge will be widened to accommodate the toll lanes; however, Woodrow Wilson Bridge will not be widened to accommodate toll lanes.
  - General Purpose lanes will remain as they are today, while the HOV lanes on I-270 will be converted to ETLs.
  - US 15 will be widened north of I-70 in Frederick County by one lane in each direction.
- Operational Assumptions
  - 2040 is the design analysis year.
  - Trucks will be permitted to use all three facilities, including MD 295.
  - No new transit lines will be created as part of this project.
  - All lane capacities are assumed to operate as freeway lanes (except MD 295).
- Tolling Policy Assumptions
  - Tolls will be Express Toll Lanes (ETLs), where everyone pays.
  - Toll locations will be placed at overhead gantries only, no tolls on ramps.
  - Dynamic toll policy will be utilized for maximizing revenue and maintaining optimal operating speeds during peak periods.

I-495 / I-270 / MD 295
Traffic Relief Plan

Alternative 4: Two Toll Lanes in Each Direction on I-270 to MD 85, MD 295 to I-695, and I-495 from the American Legion Bridge to MD 414

○ Direct Access Ramps to/from Toll Lanes
● Weave Access between Toll Lanes & General Purpose Lanes (Approximate Location)
🟩 Two Toll Lanes Each Direction Proposed
Assumed Connection to VA Express Lanes
🟧 General Purpose Lanes
🟪 Collector Distributor Lane
🟫 Existing VA Express Lanes

MDOT
MARYLAND DEPARTMENT OF TRANSPORTATION

APPENDIX D:

VISSIM Calibration Memo

1) Background and Purpose

The purpose of this document is to provide calibration and validation results for the existing VISSIM model that will be used as a basis for the traffic modeling to support the Interstate Access Point Approval (IAPA) for the I-495 and I-270 Managed Lane Study. Developing models to accurately depict existing conditions is critical to effectively evaluate future traffic operations along both corridors. Detailed assumptions and methodologies for existing model calibration and validation are outlined below.

2) Data Collection

The study area of this project includes I-270 from MD 85 to I-495 and I-495 from VA 193 to the Woodrow Wilson Bridge. The I-270 Spur between I-270 and I-495 is also included. All interchanges also include their ramp junctions, and adjacent signals are included at specific locations.

a) Peak Period Traffic Volumes

Peak period traffic volumes were developed for the study area. The AM and PM peak periods were determined to be 6:00 AM to 10:00 AM and 3:00 PM to 7:00 PM, respectively. The traffic demand was balanced throughout the network for both periods.

b) Signal Timings

Signal timing data was provided for signalized intersections within the study area to ensure that the VISSIM models included accurate existing signal timings.

c) Travel Times and Speeds

INRIX speed data obtained from the Regional Integrated Transportation Information System (RITIS) data was provided for segments along both I-495 and I-270 for the month of May 2017. Travel time data collected on Tuesdays, Wednesdays, and Thursdays of May 2017 were used to produce the target travel times and speeds.

3) VISSIM Model Development

MDOT SHA Travel Forecasting and Analysis Division (TFAD) provided a previously-calibrated VISSIM model for the study area. Lane geometry was confirmed based on aerial photography. Model calibration required specific updates, which included traffic volume inputs and routing decisions, traffic signal timings, turning speed reduction zones, driver and link behavior types, and lane change distances. These updates enabled the VISSIM model to simulate the typical weekday AM and PM peak periods under existing conditions. Discussed below is a summary of the VISSIM basic inputs, calibration requirements established for this study, and the model results and outputs.

a) Vehicle Inputs and Routing Decisions

The AM and PM models both include a seeding time of 3,600 seconds (1 hour) with four 3,600 second simulation periods for a total 14,400 seconds (4 hours) of actual simulation time, during which data was collected by the VISSIM model. The simulation time is equivalent to the aforementioned peak periods. The initialization time was necessary to populate the network and produce the appropriate congestion on the network prior to data recording.

The entry volume input data was coded for both the seeding period and each of the simulation hours in the peak period. The arrival distribution input data was set to "Exact Volume" rather than the default of "Stochastic Volume" to prevent significant volume variation at the turning movement level. Heavy vehicle and HOV percentages were established within the individual vehicle compositions as a component of the entry volume input data. Vehicle composition included 85% SOV, 12% HOV, and 3% truck volumes for all vehicle inputs.

The static routing decisions were coded in VISSIM such that the beginning of each route is as far upstream of the first decision point as possible; this method allows vehicles to make a routing decision as soon as possible, preventing unnecessary friction and congestion. In instances where routing decisions were close together, route combinations were applied to ensure realistic lane changing behavior.

b) Speeds

Posted speed limits were used as the desired speeds with +/- 5 mph linear distribution due to the severe congestion experienced along the corridor. This was the case for most locations within the study area. However, at select locations, the desired speeds were modified further for calibration purposes.

Turning movement speeds along the arterials were coded as:

i) Reduced Speed Right Turns: 8 MPH to 12 MPH
ii) Reduced Speed Left Turns: 11 MPH to 14 MPH
iii) Accelerated AM Right Turns: 7.5 MPH to 15.5 MPH
iv) Accelerated AM Left Turns: 12.4 MPH to 18.6 MPH
v) Accelerated PM Right Turns: 12 MPH to 15.5 MPH
vi) Accelerated PM Left Turns: 15 MPH to 20 MPH

4) VISSIM Calibration and Validation

Model calibration and validation refers to the process that confirms the model provides a reasonable approximation of existing field conditions and incorporates model refinements to bring it within an accepted range of validation targets. For this study, the model was run five times per peak period.

During the VISSIM model calibration; attention was given to the following parameters:

i) Modified lane changing distances to ensure smooth yet realistic traffic flow in both peak and off-peak directions.
ii) Modified driver behavior parameters and link behavior types; driver and link behavior types from the provided files were maintained, where possible.

The existing travel time data along both highways showed high variability between travel times in both the AM and PM peak hours. Travelers experienced a significant drop in speed during the peak periods. May 2017 INRIX speed data is shown in Figure 1 for I-495 and Figure 2 for I-270. High variability in travel times can be seen in the differences between the average speeds and the 95% confidence intervals.

INRIX speed data was used to produce additional figures comparing 2017 speed and travel time data to VISSIM model simulation results during the AM and PM peak hours. These figures are provided in Appendices A and B.

Figure 1: I-495 Existing Speed Graph (2017 INRIX Data)

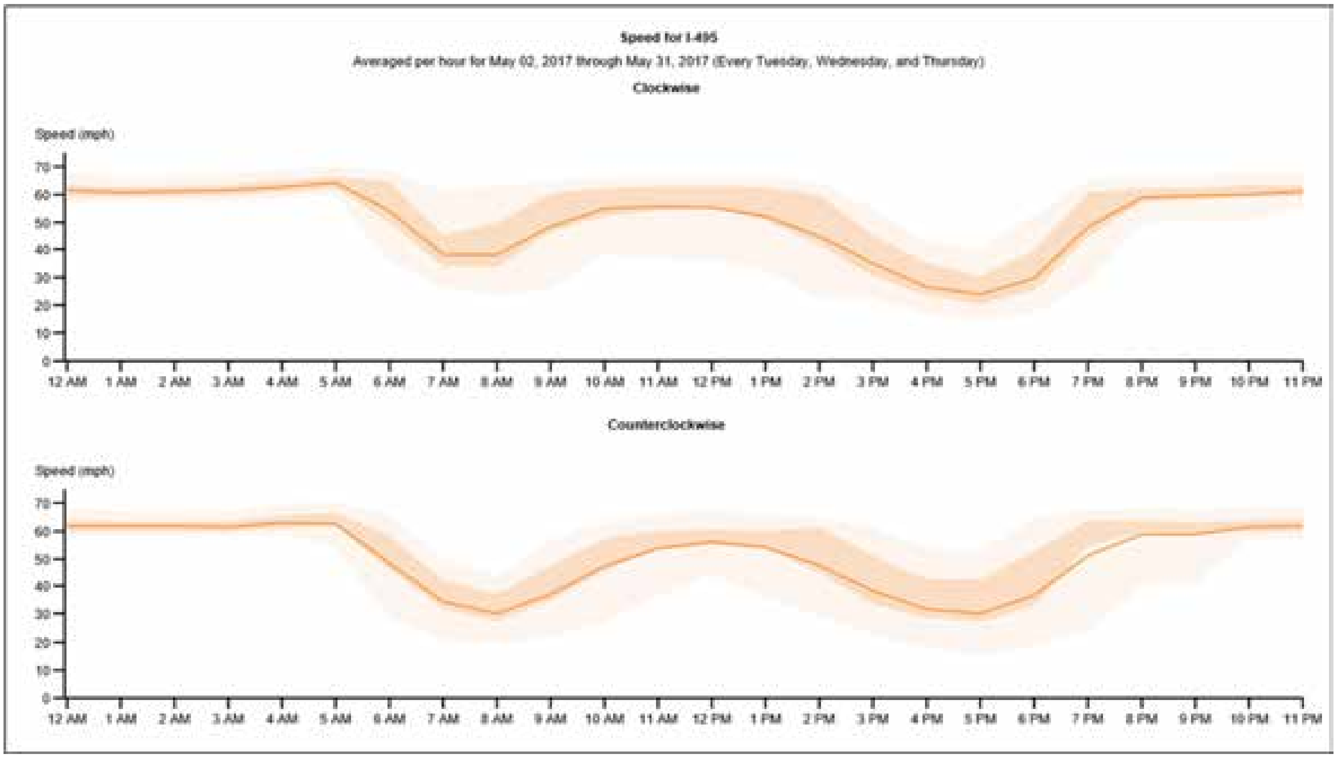
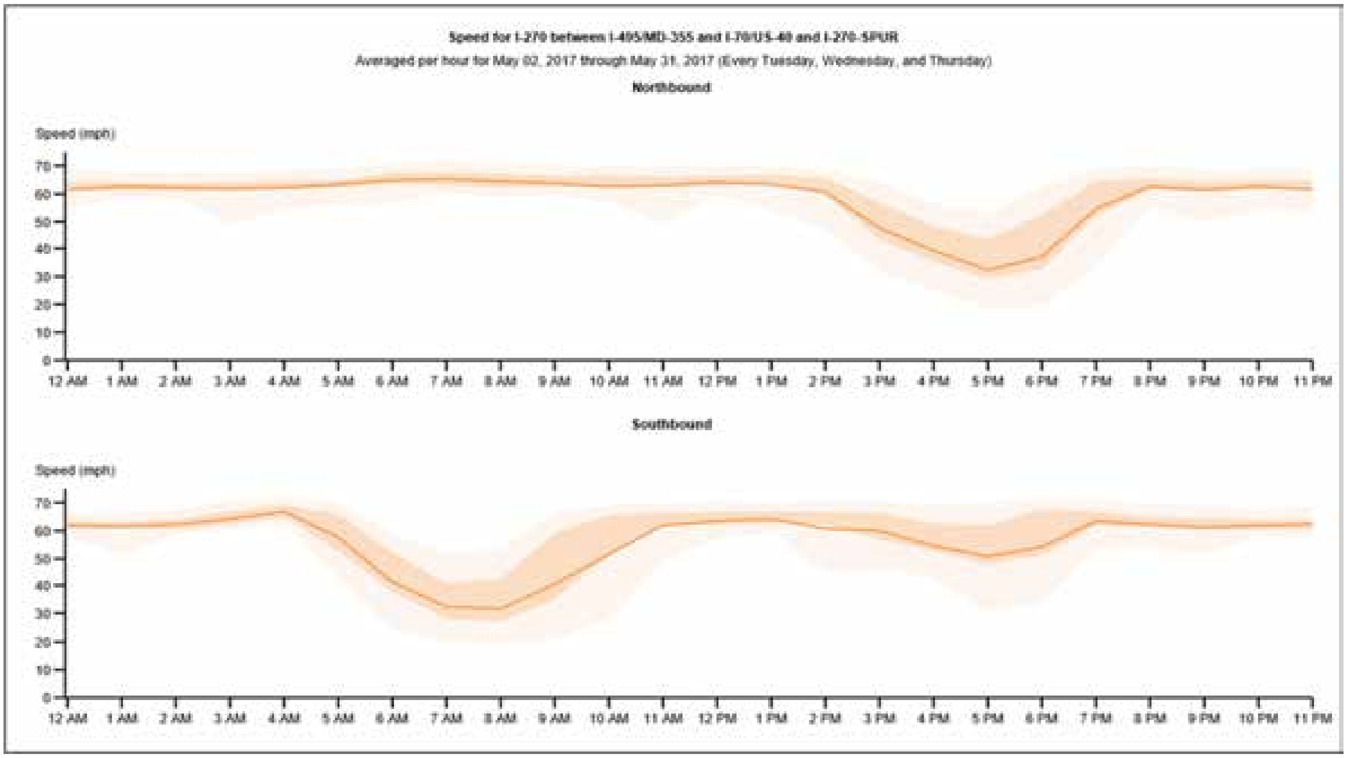


Figure 2: I-270 Existing Speed Graph (2017 INRIX Data)



According to FHWA's 2019 updated version of *Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software*, "it is important to focus calibration on a single observed day, since that day can be characterized in a microsimulation model with specific incident locations, travel times and other performance data. Attempting to calibrate a model to a synthetic day created by the averaging together of multiple days is not recommended. Synthetic days create targets that may be difficult for any model variant to replicate." This updated guidance helps to accommodate the evaluation of major freeway operations projects, especially where volume exceeds capacity. In such instances, observed volumes most likely do not represent the demand volumes, which create the congestion and oversaturation of a roadway facility.

The goal of calibrating the existing model is to develop a model that is representative of a typical day along the corridor, while also considering the volatility of the corridor and the reliability of each data set. It should be noted that for this project the speeds and travel times are reflective of May 2017 (Tuesdays, Wednesdays, and Thursdays), but the volumes were collected over multiple days, months, and years because there was not a cost-effective method to collect all volume data on the same day given the size of the study area. Both I-495 and I-270 corridors frequently experience oversaturated conditions where the observed volume does not represent the actual demand on each roadway facility. The calibration process was, therefore, pivoted to use travel time as the most reliable validation performance metric while volume was used as secondary benchmark criteria for comparison purposes.

The validation targets for the I-270 and I-495 model were:

1. Travel Time
    - VISSIM travel times fall within a 95% confidence level of INRIX travel times. The cumulative upper and lower bounds of the 95% confidence intervals were determined by first calculating the margin of error for each segment along the corridor.
2. Volumes
    - VISSIM simulated volumes fall within +/- 10% of balanced traffic count volumes

The AM and PM peak period results along the I-495 and I-270 corridors are summarized in the appendices with tables and graphics as follows:

- APPENDIX A: Speed heat maps and speed/travel time tables comparing simulated peak hour results to May 2017 INRIX data for all mainline segments. Speed heat maps have bottleneck segments boxed to correspond with the bottleneck summary list in the subsequent section of the memo.
- APPENDIX B: Travel time charts comparing simulated peak hour results to May 2017 INRIX data and confidence intervals for all mainline segments. INRIX travel time data from each Tuesday, Wednesday, and Thursday in May 2017 as well as the average travel time was plotted to illustrate high variability during peak hours. Simulated travel times are shown to typically fall within a 95% confidence level of INRIX data throughout the study corridors, with some exceptions detailed below.
- APPENDIX C: Volume tables comparing simulated peak hour results to balanced count volumes for all mainline segments.
- APPENDIX D: Volume charts comparing simulated peak hour results to balanced traffic count volumes for all mainline segments. Simulated volumes fall within 10% of balanced count volumes throughout the study corridors.

There are occurrences where the VISSIM travel time falls outside of the confidence intervals, specifically for the PM I-495 outer loop and AM I-270 southbound conditions; however, the existing conditions along these two roadways are highly volatile due to heavy congestion with multiple bottlenecks. As shown on the travel time graphs, there is significant travel time fluctuation between multiple days within the month of May. The VISSIM travel time generally follows the shape of the travel time line and falls within the individual runs along the corridor.

Bottleneck Locations

Bottlenecks can form due to several factors, including increased traffic demand, ramp merges and diverges, weaves, and lane drops. Bottlenecks may meter traffic volumes at downstream locations, resulting in higher downstream travel speeds and lower traffic volumes. A visual audit of the VISSIM simulation models was performed to ensure the models accurately replicate field observations, including the locations of bottlenecks and reduced speeds resulting from these bottlenecks. The bottlenecks were identified by reviewing RITIS travel time speed data and cross referencing the Maryland State Highway Mobility Report's list of most congested freeway sections in 2018. It should be noted that there are multiple bottleneck locations throughout the I-270 and I-495 corridors in the peak travel direction, and queuing from one bottleneck location frequently spills back into other bottleneck locations, making the individual bottlenecks difficult to locate and pinpoint.

The following is a summary of the most notable bottleneck locations identified based on speed data and observation.

I-270 Southbound (AM Peak)

- I-270 from MD 109 and MD 85: High traffic volumes entering I-270 from MD 109 and MD 80 onto a congested 2-lane section of I-270 create a bottleneck.
- I-270 from Father Hurley to MD 124: High traffic volumes merging onto I-270 from MD 124 westbound and MD 118 create a bottleneck.
- I-270 from I-370 to Montrose Rd: A combination of closely spaced interchanges, slip ramps between I-270 Local and Express lanes, and high traffic volumes entering and exiting I-270 from I-370, MD 28, MD 189, and Montrose Rd create heavy weaving conditions and reduce capacity along this stretch of I-270. After Montrose Road, I-270 Local lanes end and merge with I-270 Express lanes, resulting in traffic weaving as vehicles approach the I-270 spurs.
- I-270 West Spur from I-270 split to I-495 West: High traffic volume from I-270 southbound merges with heavy traffic volume from I-495 westbound, creating a bottleneck on the I-270 West Spur.

I-270 Northbound (PM Peak)

- I-270 East/West Spurs at I-270 split: High traffic volumes entering I-270 from I-495 inner and outer loops, coupled with traffic weaving to I-270 Local or Express lanes, creates a bottleneck at the start of I-270 northbound.
- I-270 from I-370 to MD 124: I-270 Local lanes ending after the MD 124 interchange and then merging with I-270 Express lanes' high traffic volumes causes a bottleneck.
- I-270 between MD 109 and MD 121 interchanges: A lane drop from 3 to 2 lanes, combined with high traffic volumes result in low speeds along this segment.

I-495 Inner Loop (AM Peak)

- I-495 from MD 414 to I-295: High traffic volumes from National Harbor enter a congested I-495 weave section, creating a bottleneck.
- I-495 from American Legion Bridge to VA 193: A weaving section occurs on the American Legion Bridge due to high traffic volumes entering from George Washington Memorial Parkway and exiting to Clara Barton Parkway, creating a bottleneck.

I-495 Inner Loop (PM Peak)

- I-495 from VA193 to I-270 West Spur: High traffic volumes entering the inner loop from VA 193, George Washington Memorial Parkway, Cabin John Parkway, and MD 190, coupled with a heavy weaving section prior to the I-270 northbound and I-495 westbound split, creates a bottleneck on I-495.
- I-495 from MD 187 to MD 97: High traffic volume entering the inner loop from MD 97 creates a bottleneck when merging onto a very high-volume section of I-495.
- I-495 from I-95 to MD 201: High traffic volumes entering the inner loop from I-95, US 1, and MD 201, combined with high traffic volumes on I-495, create a bottleneck on I-495.
- I-495 from US 50 to MD 214*:* High traffic volumes entering the congested inner loop from US 50, MD 202, and MD 214, combined with vehicles weaving between Arena Drive and MD 214, create a bottleneck on I-495.

I-495 Outer Loop (AM Peak)

- I-495 from I-95 and MD 97: High traffic volume merging onto the outer loop from MD 97, combined with high traffic volume on I-495, creates a bottleneck that is exacerbated by additional heavy volume entering the inner loop from US 29, MD 193, MD 650, and I-95.
- I-495 from MD 202 and Arena Drive: I-495 local and express lanes merging and subsequently dropping from 6 to 4 lanes in under one mile creates a bottleneck that is worsened by high traffic volumes from MD 202 and Arena Drive.

I-495 Outer Loop (PM Peak)

- I-495 from Clara Barton Parkway to I-270 West Spur: High traffic volumes merging onto the outer loop from MD 190 and Clara Barton Parkway create a bottleneck.
- I-495 from MD 450 to MD 201: High traffic volumes entering the outer loop from MD 295, coupled with traffic exiting and entering from MD 201, creates a bottleneck along I-495.
- I-495 from MD 202 to Arena Drive: I-495 local and express lanes merging and subsequently dropping from 6 to 4 lanes in under one mile creates a bottleneck that is worsened by high traffic volumes from MD 202 and Arena Drive.

Speed heat maps were developed to confirm bottleneck locations and compare model speeds and trends with RITIS data across the entire study area for each peak period, with bottleneck locations boxed to correspond with the locations summarized above (see APPENDIX A). Comparison of the RITIS speed data to the VISSIM simulated travel times, as documented in the speed calibration tables, also indicates the model is generally replicating the speeds based on the location of bottlenecks along the corridor. Additionally, a visual review of model simulation indicates the model is accurately replicating the identified bottleneck locations.

5) Summary of Results

The complexity of the I-495 and I-270 VISSIM study area can be characterized by its large network size, long peak period duration, and high variability of daily speeds and volumes. When evaluating the model travel times and volumes compared to the field-collected data, the model is considered reasonably calibrated based on most segments meeting the aforementioned target criteria during both the AM and PM peaks. VISSIM simulated travel times typically fall within a 95% confidence level of INRIX travel times, with some exceptions attributed to the study area's heavy congestion that causes travel times to fluctuate widely across different days. The simulated volume throughputs fall within 10% of balanced traffic count volumes throughout the I-495 and I-270 corridors. This reasonableness provides the sensitivity necessary to evaluate the future year conditions for alternative analysis.

APPENDIX A

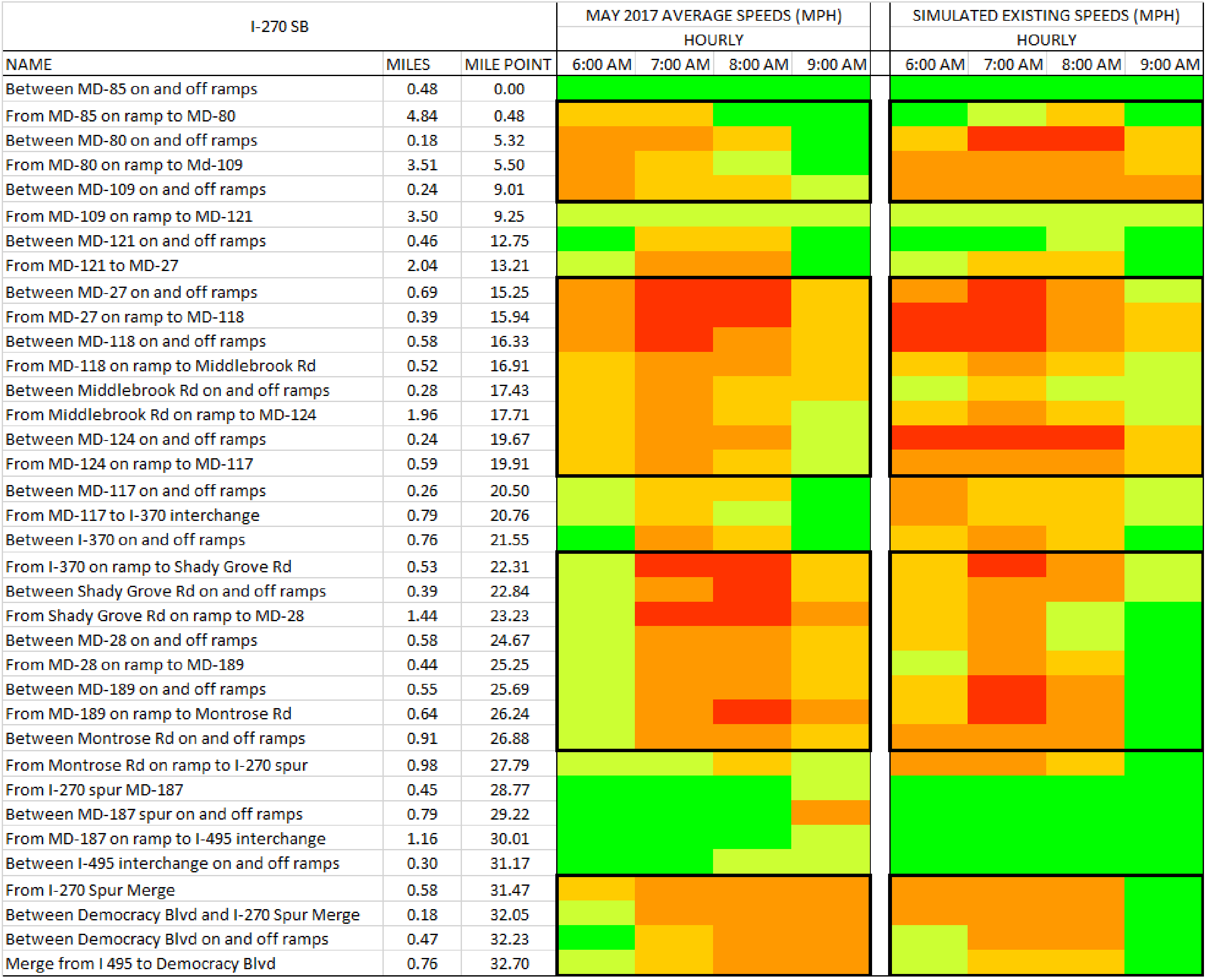
Appendix A.1: Speed Heat Maps

Appendix A.2: Speed and Travel Time Tables

Appendix A.1: Speed Heat Maps

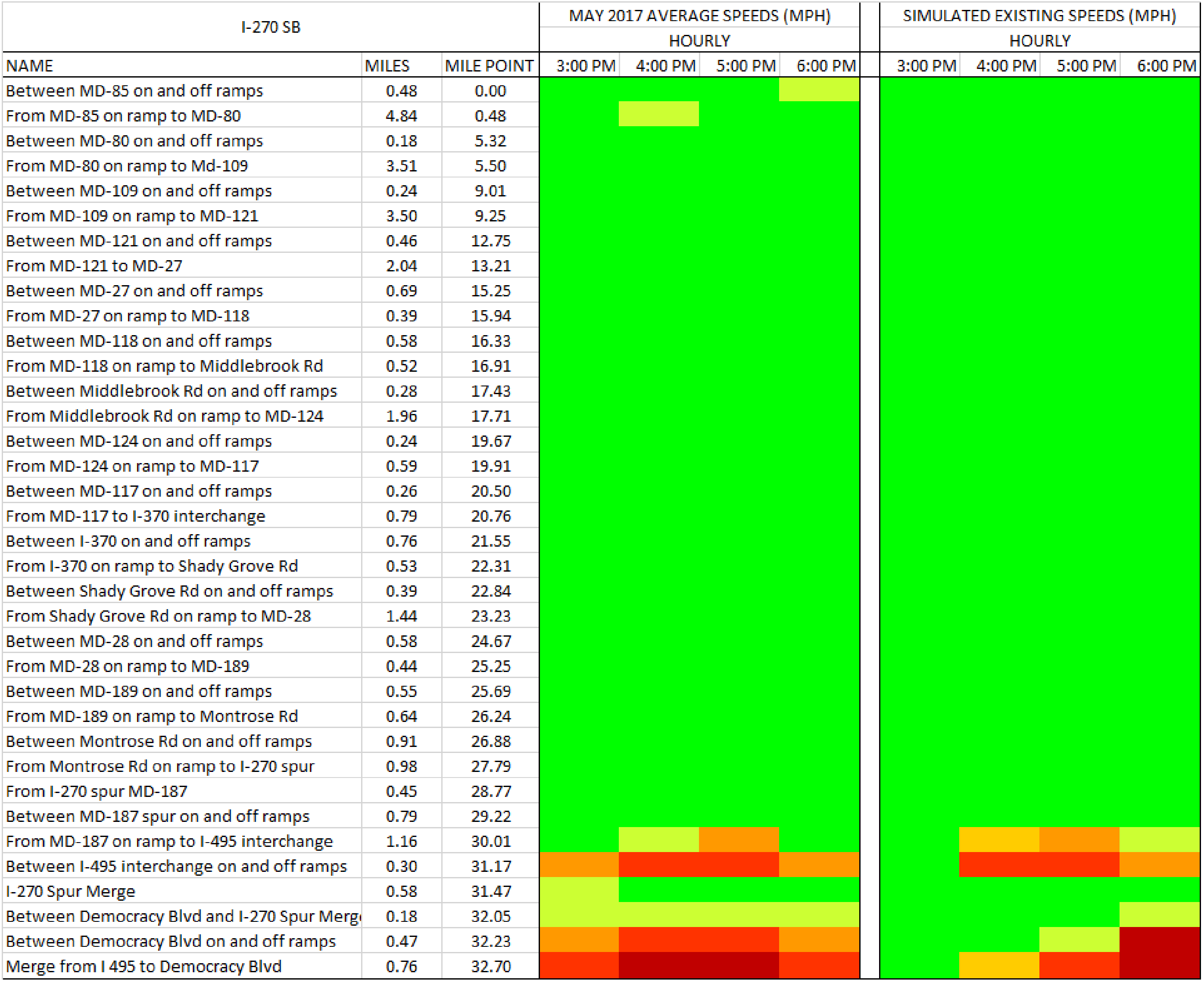
Legend	
🟥	Speed < 10 mph
🟥	10 mph < Speed < 20 mph
🟧	20 mph < Speed < 30 mph
🟨	30 mph < Speed < 40 mph
🟩	40 mph < Speed < 50 mph
🟩	Speed > 50 mph

Figure A.1: I-270 Southbound Heat Map Comparison (AM)



I-270 SB		
NAME	MILES	MILE POINT
Between MD-85 on and off ramps	0.48	0.00
From MD-85 on ramp to MD-80	4.84	0.48
Between MD-80 on and off ramps	0.18	5.32
From MD-80 on ramp to Md-109	3.51	5.50
Between MD-109 on and off ramps	0.24	9.01
From MD-109 on ramp to MD-121	3.50	9.25
Between MD-121 on and off ramps	0.46	12.75
From MD-121 to MD-27	2.04	13.21
Between MD-27 on and off ramps	0.69	15.25
From MD-27 on ramp to MD-118	0.39	15.94
Between MD-118 on and off ramps	0.58	16.33
From MD-118 on ramp to Middlebrook Rd	0.52	16.91
Between Middlebrook Rd on and off ramps	0.28	17.43
From Middlebrook Rd on ramp to MD-124	1.96	17.71
Between MD-124 on and off ramps	0.24	19.67
From MD-124 on ramp to MD-117	0.59	19.91
Between MD-117 on and off ramps	0.26	20.50
From MD-117 to I-370 interchange	0.79	20.76
Between I-370 on and off ramps	0.76	21.55
From I-370 on ramp to Shady Grove Rd	0.53	22.31
Between Shady Grove Rd on and off ramps	0.39	22.84
From Shady Grove Rd on ramp to MD-28	1.44	23.23
Between MD-28 on and off ramps	0.58	24.67
From MD-28 on ramp to MD-189	0.44	25.25
Between MD-189 on and off ramps	0.55	25.69
From MD-189 on ramp to Montrose Rd	0.64	26.24
Between Montrose Rd on and off ramps	0.91	26.88
From Montrose Rd on ramp to I-270 spur	0.98	27.79
From I-270 spur MD-187	0.45	28.77
Between MD-187 spur on and off ramps	0.79	29.22
From MD-187 on ramp to I-495 interchange	1.16	30.01
Between I-495 interchange on and off ramps	0.30	31.17
From I-270 Spur Merge	0.58	31.47
Between Democracy Blvd and I-270 Spur Merge	0.18	32.05
Between Democracy Blvd on and off ramps	0.47	32.23
Merge from I 495 to Democracy Blvd	0.76	32.70

Figure A.2: I-270 Southbound Heat Map Comparison (PM)

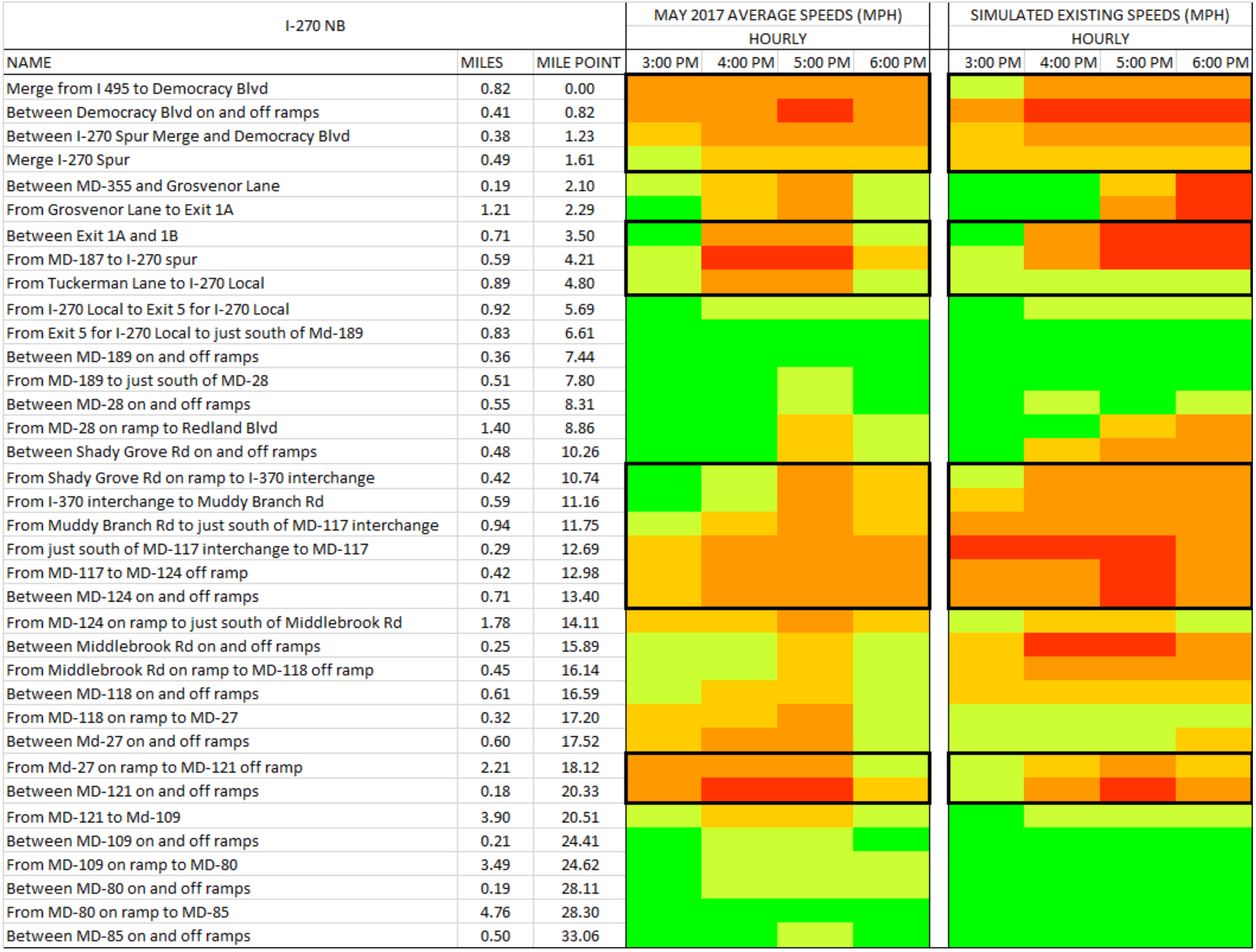


I-270 SB			MAY 2017 AVERAGE SPEEDS (MPH)				SIMULATED EXISTING SPEEDS (MPH)			
			HOURLY				HOURLY			
NAME	MILES	MILE POINT	3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Between MD-85 on and off ramps	0.48	0.00	🟩	🟩	🟩	🟨	🟩	🟩	🟩	🟩
From MD-85 on ramp to MD-80	4.84	0.48	🟩	🟨	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-80 on and off ramps	0.18	5.32	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-80 on ramp to Md-109	3.51	5.50	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-109 on and off ramps	0.24	9.01	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-109 on ramp to MD-121	3.50	9.25	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-121 on and off ramps	0.46	12.75	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-121 to MD-27	2.04	13.21	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-27 on and off ramps	0.69	15.25	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-27 on ramp to MD-118	0.39	15.94	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-118 on and off ramps	0.58	16.33	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-118 on ramp to Middlebrook Rd	0.52	16.91	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between Middlebrook Rd on and off ramps	0.28	17.43	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From Middlebrook Rd on ramp to MD-124	1.96	17.71	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-124 on and off ramps	0.24	19.67	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-124 on ramp to MD-117	0.59	19.91	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-117 on and off ramps	0.26	20.50	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-117 to I-370 interchange	0.79	20.76	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between I-370 on and off ramps	0.76	21.55	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From I-370 on ramp to Shady Grove Rd	0.53	22.31	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between Shady Grove Rd on and off ramps	0.39	22.84	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From Shady Grove Rd on ramp to MD-28	1.44	23.23	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-28 on and off ramps	0.58	24.67	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-28 on ramp to MD-189	0.44	25.25	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-189 on and off ramps	0.55	25.69	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-189 on ramp to Montrose Rd	0.64	26.24	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between Montrose Rd on and off ramps	0.91	26.88	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From Montrose Rd on ramp to I-270 spur	0.98	27.79	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From I-270 spur MD-187	0.45	28.77	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-187 spur on and off ramps	0.79	29.22	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-187 on ramp to I-495 interchange	1.16	30.01	🟩	🟨	🟧	🟩	🟩	🟡	🟧	🟨
Between I-495 interchange on and off ramps	0.30	31.17	🟧	🟥	🟥	🟧	🟩	🟥	🟥	🟧
I-270 Spur Merge	0.58	31.47	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between Democracy Blvd and I-270 Spur Merg	0.18	32.05	🟨	🟨	🟨	🟨	🟩	🟩	🟩	🟨
Between Democracy Blvd on and off ramps	0.47	32.23	🟧	🟥	🟥	🟧	🟩	🟩	🟨	🟫
Merge from I 495 to Democracy Blvd	0.76	32.70	🟥	🟫	🟫	🟥	🟩	🟡	🟥	🟫

Figure A.3: I-270 Northbound Heat Map Comparison (AM)

I-270 NB			MAY 2017 AVERAGE SPEEDS (MPH)				SIMULATED EXISTING SPEEDS (MPH)			
			HOURLY				HOURLY			
NAME	MILES	MILE POINT	6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
Between MD-355 and Grosvenor Lane	0.19	0.00	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From Grosvenor Lane to Exit 1A	1.21	0.19	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between Exit 1A and 1B	0.71	1.40	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-187 to I-270 spur	0.59	2.11	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From Tuckerman Lane to I-270 Local	0.89	2.70	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From I-270 Local to Exit 5 for I-270 Local	0.92	3.59	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From Exit 5 for I-270 Local to just south of Md-189	0.83	4.51	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-189 on and off ramps	0.36	5.34	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-189 to just south of MD-28	0.51	5.70	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-28 on and off ramps	0.55	6.21	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-28 on ramp to Redland Blvd	1.40	6.76	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between Shady Grove Rd on and off ramps	0.48	8.16	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From Shady Grove Rd on ramp to I-370 interchange	0.42	8.64	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From I-370 interchange to Muddy Branch Rd	0.59	9.06	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From Muddy Branch Rd to just south of MD-117 interchange	0.94	9.65	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From just south of MD-117 interchange to MD-117	0.29	10.59	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-117 to MD-124 off ramp	0.42	10.88	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-124 on and off ramps	0.71	11.30	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-124 on ramp to just south of Middlebrook Rd	1.78	12.01	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between Middlebrook Rd on and off ramps	0.25	13.79	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From Middlebrook Rd on ramp to MD-118 off ramp	0.45	14.04	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-118 on and off ramps	0.61	14.49	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-118 on ramp to MD-27	0.32	15.10	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between Md-27 on and off ramps	0.60	15.42	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From Md-27 on ramp to MD-121 off ramp	2.21	16.02	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-121 on and off ramps	0.18	18.23	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-121 to Md-109	3.90	18.41	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-109 on and off ramps	0.21	22.31	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-109 on ramp to MD-80	3.49	22.52	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-80 on and off ramps	0.19	26.01	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
From MD-80 on ramp to MD-85	4.76	26.20	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between MD-85 on and off ramps	0.50	30.96	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Merge from I 495	0.82	31.46	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between Democracy Blvd on and off ramps	0.41	32.28	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Between I-270 Spur Merge and Democracy Blvd	0.38	32.69	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
Merge I-270 Spur	0.49	33.07	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩

Figure A.4: I-270 Northbound Heat Map Comparison (PM)



I-270 NB			MAY 2017 AVERAGE SPEEDS (MPH)				SIMULATED EXISTING SPEEDS (MPH)			
			HOURLY				HOURLY			
NAME	MILES	MILE POINT	3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Merge from I 495 to Democracy Blvd	0.82	0.00								
Between Democracy Blvd on and off ramps	0.41	0.82								
Between I-270 Spur Merge and Democracy Blvd	0.38	1.23								
Merge I-270 Spur	0.49	1.61								
Between MD-355 and Grosvenor Lane	0.19	2.10								
From Grosvenor Lane to Exit 1A	1.21	2.29								
Between Exit 1A and 1B	0.71	3.50								
From MD-187 to I-270 spur	0.59	4.21								
From Tuckerman Lane to I-270 Local	0.89	4.80								
From I-270 Local to Exit 5 for I-270 Local	0.92	5.69								
From Exit 5 for I-270 Local to just south of Md-189	0.83	6.61								
Between MD-189 on and off ramps	0.36	7.44								
From MD-189 to just south of MD-28	0.51	7.80								
Between MD-28 on and off ramps	0.55	8.31								
From MD-28 on ramp to Redland Blvd	1.40	8.86								
Between Shady Grove Rd on and off ramps	0.48	10.26								
From Shady Grove Rd on ramp to I-370 interchange	0.42	10.74								
From I-370 interchange to Muddy Branch Rd	0.59	11.16								
From Muddy Branch Rd to just south of MD-117 interchange	0.94	11.75								
From just south of MD-117 interchange to MD-117	0.29	12.69								
From MD-117 to MD-124 off ramp	0.42	12.98								
Between MD-124 on and off ramps	0.71	13.40								
From MD-124 on ramp to just south of Middlebrook Rd	1.78	14.11								
Between Middlebrook Rd on and off ramps	0.25	15.89								
From Middlebrook Rd on ramp to MD-118 off ramp	0.45	16.14								
Between MD-118 on and off ramps	0.61	16.59								
From MD-118 on ramp to MD-27	0.32	17.20								
Between Md-27 on and off ramps	0.60	17.52								
From Md-27 on ramp to MD-121 off ramp	2.21	18.12								
Between MD-121 on and off ramps	0.18	20.33								
From MD-121 to Md-109	3.90	20.51								
Between MD-109 on and off ramps	0.21	24.41								
From MD-109 on ramp to MD-80	3.49	24.62								
Between MD-80 on and off ramps	0.19	28.11								
From MD-80 on ramp to MD-85	4.76	28.30								
Between MD-85 on and off ramps	0.50	33.06								

Figure A.5: I-495 Inner Loop Heat Map Comparison (AM)

I-495 IL			MAY 2017 AVERAGE SPEEDS (MPH)				SIMULATED EXISTING SPEEDS (MPH)			
			HOURLY				HOURLY			
NAME	MILES	MILE POINT	6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
VA-193/GEORGETOWN PIKE/EXIT 13	0.41	0.00	🟩	🟧	🟥	🟥	🟩	🟩	🟧	🟥
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	0.54	0.41	🟩	🟧	🟥	🟥	🟩	🟧	🟥	🟫
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	0.55	0.95	🟩	🟡	🟧	🟧	🟩	🟧	🟥	🟥
AMERICAN LEGION BRIDGE	0.16	1.50	🟩	🟡	🟡	🟡	🟡	🟧	🟧	🟧
BEFORE AMERICAN LEGION BRIDGE	0.10	1.66	🟩	🟡	🟡	🟡	🟡	🟡	🟡	🟡
MERGE CLARA BARTON PARKWAY	0.19	1.76	🟩	🟨	🟨	🟨	🟩	🟩	🟩	🟩
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	1.35	1.95	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE CABIN JOHN PARKWAY	0.38	3.30	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN CABIN JOHN PARKWAY AND MD 190	0.07	3.68	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 190	0.24	3.75	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 190 AND I 270	1.13	3.99	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE I 270	0.24	5.12	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN I 270 AND MD 187	1.48	5.36	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 187	0.41	6.84	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 187 AND I 270	0.43	7.25	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
MERGE BEFORE I 270	0.28	7.68	🟩	🟨	🟨	🟨	🟩	🟩	🟩	🟩
MERGE AFTER I 270	0.11	7.96	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
MD 355 MERGE	0.26	8.07	🟩	🟩	🟨	🟡	🟩	🟩	🟩	🟩
BETWEEN MD 355 AND MD 185	1.15	8.33	🟩	🟨	🟡	🟡	🟩	🟨	🟨	🟩
MD 185 MERGE	0.39	9.48	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
BETWEEN MD 185 AND MD 97	1.88	9.87	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
MD 97 MERGE	0.27	11.75	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 97 AND US 29	1.13	12.02	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE US 29	0.33	13.15	🟩	🟩	🟩	🟨	🟩	🟩	🟩	🟩
BETWEEN MD US 29 AND MD 193	0.31	13.48	🟩	🟩	🟩	🟨	🟩	🟩	🟩	🟩
MERGE MD 193	0.40	13.79	🟩	🟩	🟩	🟨	🟩	🟩	🟩	🟩
BETWEEN MD 193 AND MD 650	1.14	14.19	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 650	0.57	15.33	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 650 AND I 95	0.55	15.90	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BEFORE I 95 MERGE	1.06	16.45	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
AFTER I 95 MERGE	0.49	17.51	🟩	🟡	🟧	🟡	🟩	🟩	🟨	🟥
MERGE US 1	0.54	18.00	🟩	🟡	🟧	🟡	🟩	🟨	🟡	🟧
BEFORE GREENBELT STATION MERGE	0.67	18.54	🟩	🟨	🟡	🟡	🟩	🟡	🟡	🟡
AFTER GREENBELT STATION MERGE	0.10	19.21	🟩	🟩	🟨	🟨	🟨	🟡	🟡	🟡
BETWEEN GREENBELT STATION AND MD 201	0.84	19.31	🟩	🟩	🟩	🟩	🟩	🟨	🟨	🟨
MERGE MD 201	0.57	20.15	🟩	🟩	🟩	🟨	🟩	🟩	🟩	🟨
BETWEEN MD 201 AND MD 295 MERGE	0.37	20.72	🟩	🟩	🟩	🟩	🟩	🟨	🟨	🟡
MERGE MD 295	0.53	21.09	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 295 AND MD 450	2.02	21.62	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 450	0.23	23.64	🟩	🟩	🟩	🟨	🟩	🟩	🟩	🟩
BETWEEN MD 450 AND US 50	0.53	23.87	🟩	🟩	🟩	🟨	🟩	🟩	🟨	🟨
MERGE US 50	0.81	24.40	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	1.03	25.21	🟩	🟩	🟩	🟨	🟩	🟩	🟩	🟩
END 495 EXPRESS LANE	0.10	26.24	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BEFORE MD 202 MERGE	0.35	26.34	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 202	0.47	26.69	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 202 AND ARENA DR	0.25	27.16	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE ARENA DR	0.39	27.41	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN ARENA DR AND MD 214	0.63	27.80	🟩	🟩	🟩	🟨	🟩	🟩	🟩	🟩
MD 214 MERGE	0.50	28.43	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
BETWEEN MD 214 AND RITCHIE MARLBORO RD	1.11	28.93	🟩 -	🟩 -	🟩 -	🟩 -	🟩	🟩	🟩	🟩
MERGE RITCHIE MARLBORO RD	0.57	30.04	🟩 -	🟩 -	🟩 -	🟩 -	🟩	🟩	🟩	🟩
BETWEEN RITCHIE MARLBORO AND MD 4	1.84	30.61	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
MERGE MD 4	0.50	32.45	🟩	🟩	🟨	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 4 AND FORESTVILLE RD	0.63	32.95	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE FORESTVILLE RD	0.19	33.58	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN FORESTVILLE AND MD 218	0.61	33.77	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 218	0.31	34.38	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 218 AND MD 5	1.20	34.69	🟩	🟩	🟩	🟩	🟩	🟩	🟨	🟩
MERGE MD 5	0.52	35.89	🟩	🟡	🟡	🟩	🟩	🟧	🟥	🟨
BETWEEN MD 5 AND MD 414	2.25	36.41	🟨	🟥	🟧	🟨	🟩	🟥	🟥	🟡
MERGE MD 414	0.66	38.66	🟨	🟥	🟥	🟨	🟨	🟥	🟥	🟧
BETWEEN MD 414 AND MD 210	0.47	39.32	🟨	🟥	🟥	🟨	🟨	🟧	🟧	🟨
MERGE MD 210	1.07	39.79	🟡	🟫	🟥	🟡	🟡	🟧	🟧	🟨
BETWEEN MD 210 AND I 295	0.56	40.86	🟡	🟥	🟥	🟡	🟧	🟧	🟥	🟨
MERGE I 295	0.62	41.42	🟨	🟧	🟧	🟨	🟡	🟡	🟧	🟨
BEFORE WOODROW WILSON BRIDGE	0.22	42.04	🟩	🟨	🟨	🟩	🟩	🟩	🟩	🟩
WOODROW WILSON BRIDGE	1.16	42.26	🟩	🟩	🟨	🟩	🟩	🟩	🟩	🟩

Figure A.6: I-495 Inner Loop Heat Map Comparison (PM)

I-495 IL			MAY 2017 AVERAGE SPEEDS (MPH)				SIMULATED EXISTING SPEEDS (MPH)			
			HOURLY				HOURLY			
NAME	MILES	MILE POINT	3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
VA-193/GEORGETOWN PIKE/EXIT 13	0.41	0.00	🟥	🟫	🟫	🟫	🟩	🟥	🟫	🟫
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	0.54	0.41	🟥	🟫	🟫	🟥	🟩	🟫	🟫	🟫
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	0.55	0.95	🟥	🟥	🟥	🟥	🟨	🟥	🟥	🟥
AMERICAN LEGION BRIDGE	0.16	1.50	🟧	🟥	🟥	🟥	🟧	🟥	🟥	🟥
BEFORE AMERICAN LEGION BRIDGE	0.10	1.66	🟧	🟥	🟥	🟥	🟧	🟥	🟥	🟥
MERGE CLARA BARTON PARKWAY	0.19	1.76	🟧	🟥	🟥	🟥	🟧	🟥	🟥	🟥
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	1.35	1.95	🟧	🟥	🟥	🟥	🟧	🟥	🟥	🟥
MERGE CABIN JOHN PARKWAY	0.38	3.30	🟧	🟥	🟥	🟥	🟥	🟥	🟥	🟥
BETWEEN CABIN JOHN PARKWAY AND MD 190	0.07	3.68	🟧	🟥	🟥	🟥	🟥	🟥	🟥	🟥
MERGE MD 190	0.24	3.75	🟧	🟥	🟥	🟥	🟥	🟥	🟥	🟥
BETWEEN MD 190 AND I 270	1.13	3.99	🟧	🟥	🟥	🟧	🟧	🟧	🟧	🟧
MERGE I 270	0.24	5.12	🟩	🟩	🟢	🟩	🟩	🟩	🟩	🟢
BETWEEN I 270 AND MD 187	1.48	5.36	🟩	🟩	🟩	🟩	🟩	🟢	🟧	🟥
MERGE MD 187	0.41	6.84	🟨	🟢	🟧	🟧	🟩	🟥	🟫	🟫
BETWEEN MD 187 AND I 270	0.43	7.25	🟥	🟧	🟥	🟥	🟢	🟥	🟫	🟥
MERGE BEFORE I 270	0.28	7.68	🟥	🟥	🟫	🟥	🟨	🟥	🟥	🟥
MERGE AFTER I 270	0.11	7.96	🟥	🟥	🟥	🟥	🟨	🟥	🟥	🟥
MD 355 MERGE	0.26	8.07	🟥	🟥	🟥	🟥	🟨	🟥	🟥	🟥
BETWEEN MD 355 AND MD 185	1.15	8.33	🟥	🟥	🟥	🟥	🟧	🟥	🟥	🟥
MD 185 MERGE	0.39	9.48	🟥	🟥	🟥	🟥	🟥	🟥	🟥	🟥
BETWEEN MD 185 AND MD 97	1.88	9.87	🟨	🟧	🟧	🟧	🟧	🟧	🟧	🟥
MD 97 MERGE	0.27	11.75	🟨	🟧	🟧	🟧	🟧	🟧	🟥	🟥
BETWEEN MD 97 AND US 29	1.13	12.02	🟢	🟧	🟧	🟨	🟨	🟨	🟧	🟧
MERGE US 29	0.33	13.15	🟢	🟨	🟧	🟨	🟩	🟧	🟧	🟥
BETWEEN MD US 29 AND MD 193	0.31	13.48	🟨	🟧	🟧	🟧	🟢	🟥	🟥	🟥
MERGE MD 193	0.40	13.79	🟨	🟧	🟧	🟧	🟨	🟧	🟥	🟥
BETWEEN MD 193 AND MD 650	1.14	14.19	🟢	🟨	🟨	🟨	🟨	🟨	🟨	🟧
MERGE MD 650	0.57	15.33	🟢	🟢	🟨	🟨	🟨	🟨	🟨	🟧
BETWEEN MD 650 AND I 95	0.55	15.90	🟢	🟢	🟨	🟨	🟩	🟩	🟩	🟧
BEFORE I 95 MERGE	1.06	16.45	🟩	🟨	🟧	🟨	🟩	🟨	🟨	🟢
AFTER I 95 MERGE	0.49	17.51	🟧	🟥	🟥	🟥	🟥	🟥	🟥	🟧
MERGE US 1	0.54	18.00	🟧	🟥	🟥	🟥	🟥	🟥	🟥	🟥
BEFORE GREENBELT STATION MERGE	0.67	18.54	🟧	🟥	🟥	🟧	🟨	🟨	🟧	🟧
AFTER GREENBELT STATION MERGE	0.10	19.21	🟧	🟧	🟧	🟧	🟢	🟢	🟨	🟨
BETWEEN GREENBELT STATION AND MD 201	0.84	19.31	🟨	🟧	🟧	🟨	🟢	🟢	🟨	🟧
MERGE MD 201	0.57	20.15	🟧	🟧	🟧	🟨	🟢	🟨	🟥	🟥
BETWEEN MD 201 AND MD 295 MERGE	0.37	20.72	🟨	🟧	🟧	🟨	🟢	🟨	🟧	🟨
MERGE MD 295	0.53	21.09	🟨	🟧	🟧	🟨	🟢	🟢	🟧	🟨
BETWEEN MD 295 AND MD 450	2.02	21.62	🟨	🟧	🟧	🟨	🟢	🟨	🟧	🟧
MERGE MD 450	0.23	23.64	🟨	🟧	🟧	🟨	🟨	🟧	🟥	🟧
BETWEEN MD 450 AND US 50	0.53	23.87	🟢	🟨	🟨	🟨	🟢	🟧	🟥	🟧
MERGE US 50	0.81	24.40	🟨	🟧	🟧	🟨	🟨	🟥	🟥	🟥
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	1.03	25.21	🟨	🟧	🟧	🟨	🟧	🟧	🟧	🟧
END 495 EXPRESS LANE	0.10	26.24	🟨	🟧	🟧	🟨	🟧	🟧	🟢	🟨
BEFORE MD 202 MERGE	0.35	26.34	🟨	🟧	🟧	🟨	🟧	🟧	🟨	🟧
MERGE MD 202	0.47	26.69	🟨	🟧	🟧	🟧	🟧	🟧	🟧	🟧
BETWEEN MD 202 AND ARENA DR	0.25	27.16	🟧	🟥	🟥	🟧	🟥	🟧	🟧	🟧
MERGE ARENA DR	0.39	27.41	🟧	🟥	🟥	🟧	🟧	🟧	🟧	🟧
BETWEEN ARENA DR AND MD 214	0.63	27.80	🟧	🟧	🟧	🟧	🟢	🟢	🟨	🟢
MD 214 MERGE	0.50	28.43	🟧	🟧	🟧	🟧	🟢	🟢	🟨	🟨
BETWEEN MD 214 AND RITCHIE MARLBORO RD	1.11	28.93	-	-	-	-	-	-	-	-
MERGE RITCHIE MARLBORO RD	0.57	30.04	-	-	-	-	-	-	-	-
BETWEEN RITCHIE MARLBORO AND MD 4	1.84	30.61	🟢	🟢	🟢	🟢	🟩	🟩	🟩	🟩
MERGE MD 4	0.50	32.45	🟩	🟩	🟢	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 4 AND FORESTVILLE RD	0.63	32.95	🟩	🟩	🟢	🟩	🟩	🟩	🟩	🟩
MERGE FORESTVILLE RD	0.19	33.58	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN FORESTVILLE AND MD 218	0.61	33.77	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 218	0.31	34.38	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 218 AND MD 5	1.20	34.69	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 5	0.52	35.89	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 5 AND MD 414	2.25	36.41	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 414	0.66	38.66	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 414 AND MD 210	0.47	39.32	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 210	1.07	39.79	🟩	🟢	🟧	🟢	🟩	🟩	🟨	🟢
BETWEEN MD 210 AND I 295	0.56	40.86	🟩	🟨	🟥	🟨	🟩	🟨	🟥	🟧
MERGE I 295	0.62	41.42	🟩	🟨	🟧	🟨	🟩	🟧	🟧	🟨
BEFORE WOODROW WILSON BRIDGE	0.22	42.04	🟩	🟢	🟨	🟢	🟩	🟢	🟢	🟢
WOODROW WILSON BRIDGE	1.16	42.26	🟩	🟢	🟢	🟢	🟩	🟩	🟩	🟩

Figure A.7: I-495 Outer Loop Heat Map Comparison (AM)

I-495 OL			MAY 2017 AVERAGE SPEEDS (MPH)				SIMULATED EXISTING SPEEDS (MPH)			
			HOURLY				HOURLY			
NAME	MILES	MILE POINT	6:00 AM	7:00 AM	8:00 AM	9:00 AM	6:00 AM	7:00 AM	8:00 AM	9:00 AM
VA-193/GEORGETOWN PIKE/EXIT 13 (1)	0.43	0.00	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
VA-193/GEORGETOWN PIKE/EXIT 13 (2)	0.37	0.43	🟩	🟩	🟨	🟡	🟩	🟩	🟩	🟩
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	0.52	0.80	🟩	🟩	🟨	🟡	🟩	🟩	🟩	🟩
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	0.15	1.32	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
AMERICAN LEGION BRIDGE	0.16	1.47	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
BEFORE AMERICAN LEGION BRIDGE	0.10	1.63	🟩	🟩	🟩	🟨	🟩	🟩	🟩	🟩
MERGE CLARA BARTON PARKWAY	0.28	1.73	🟩	🟩	🟨	🟡	🟨	🟨	🟨	🟨
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	1.20	2.01	🟩	🟩	🟨	🟡	🟨	🟨	🟨	🟨
MERGE CABIN JOHN PARKWAY	0.45	3.21	🟩	🟩	🟡	🟧	🟩	🟨	🟩	🟩
BETWEEN CABIN JOHN PARKWAY AND MD 190	0.07	3.66	🟩	🟩	🟡	🟧	🟩	🟩	🟩	🟩
MERGE MD 190	0.30	3.73	🟩	🟩	🟡	🟧	🟩	🟩	🟩	🟩
BETWEEN MD 190 AND I 270	1.06	4.03	🟩	🟩	🟨	🟡	🟩	🟨	🟨	🟩
MERGE I 270	0.29	5.09	🟩	🟩	🟡	🟡	🟩	🟩	🟩	🟩
BETWEEN I 270 WEST AND MD 187	1.44	5.38	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
MERGE MD 187	0.36	6.82	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN I 270 EAST AND MD 187	0.58	7.18	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE BEFORE I 270	0.23	7.76	🟩	🟩	🟩	🟨	🟨	🟨	🟨	🟨
MERGE AFTER I 270	0.02	7.99	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MD 355 MERGE	0.27	8.01	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 355 AND MD 185	1.19	8.28	🟩	🟩	🟨	🟩	🟩	🟩	🟨	🟨
MD 185 MERGE	0.62	9.47	🟩	🟨	🟨	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 185 AND MD 97	1.67	10.09	🟩	🟨	🟨	🟨	🟧	🟡	🟡	🟡
MD 97 MERGE	0.33	11.76	🟨	🟧	🟧	🟧	🟥	🟥	🟥	🟥
BETWEEN MD 97 AND US 29	1.12	12.09	🟡	🟧	🟥	🟧	🟧	🟥	🟥	🟥
MERGE US 29	0.22	13.21	🟧	🟥	🟥	🟥	🟥	🟥	🟥	🟥
BETWEEN MD US 29 AND MD 193	0.50	13.43	🟧	🟥	🟥	🟥	🟥	🟥	🟥	🟥
MERGE MD 193	0.26	13.93	🟧	🟥	🟥	🟥	🟥	🟥	🟥	🟥
BETWEEN MD 193 AND MD 650	1.20	14.19	🟧	🟥	🟫	🟥	🟥	🟥	🟥	🟥
MERGE MD 650	0.48	15.39	🟧	🟫	🟫	🟥	🟧	🟫	🟫	🟥
BETWEEN MD 650 AND I 95	0.77	15.87	🟧	🟫	🟫	🟥	🟡	🟥	🟥	🟥
I 95 MERGE	0.85	16.64	🟡	🟥	🟥	🟡	🟩	🟩	🟩	🟩
BETWEEN US 1 AND I 95	0.58	17.49	🟩	🟨	🟨	🟩	🟩	🟩	🟩	🟩
MERGE US 1	0.52	18.07	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN GREENBELT STATION AND US 1	0.78	18.59	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN GREENBELT STATION AND MD 201	0.88	19.37	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 201	0.58	20.25	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 201 AND MD 295 MERGE	0.38	20.83	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 295	0.49	21.21	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 295 AND MD 450	2.04	21.70	🟩	🟩	🟨	🟩	🟨	🟨	🟨	🟩
MERGE MD 450	0.36	23.74	🟩	🟡	🟡	🟨	🟨	🟧	🟧	🟩
BETWEEN MD 450 AND US 50	0.46	24.10	🟩	🟡	🟧	🟡	🟩	🟧	🟧	🟩
MERGE US 50	0.70	24.56	🟩	🟡	🟡	🟨	🟩	🟩	🟩	🟩
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	1.09	25.26	🟩	🟡	🟡	🟡	🟨	🟡	🟡	🟡
END 495 EXPRESS LANE	0.10	26.35	🟩	🟧	🟧	🟧	🟥	🟥	🟥	🟥
BEFORE MD 202 MERGE	0.20	26.45	🟩	🟧	🟧	🟡	🟧	🟥	🟥	🟥
MERGE MD 202	0.68	26.65	🟩	🟧	🟧	🟧	🟩	🟧	🟧	🟧
BETWEEN MD 202 AND ARENA DR	0.23	27.33	🟩	🟡	🟧	🟡	🟩	🟡	🟧	🟡
MERGE ARENA DR	0.46	27.56	🟩	🟡	🟡	🟨	🟩	🟨	🟧	🟨
BETWEEN ARENA DR AND MD 214	0.53	28.02	🟩	🟨	🟡	🟨	🟩	🟩	🟧	🟡
MERGE MD 214	0.50	28.55	🟩	🟨	🟡	🟨	🟩	🟩	🟡	🟨
BETWEEN MD 214 AND RITCHIE MARLBORO RD	1.18	29.05	🟩	🟨	🟨	🟨	🟩	🟩	🟨	🟩
MERGE RITCHIE MARLBORO RD	0.45	30.23	-	-	-	-	🟩	🟩	🟩	🟩
BETWEEN RITCHIE MARLBORO AND MD 4	1.87	30.68	-	-	-	-	🟩	🟩	🟩	🟩
MERGE MD 4	0.58	32.55	🟩	🟨	🟡	🟨	🟩	🟩	🟩	🟩
BETWEEN MD 4 AND FORESTVILLE RD	0.61	33.13	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
MERGE MD 337	0.17	33.74	🟩	🟩	🟡	🟨	🟩	🟩	🟩	🟩
BETWEEN FORESTVILLE AND MD 218	0.90	33.91	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
MERGE MD 218	0.05	34.81	🟩	🟩	🟨	🟨	🟩	🟩	🟩	🟩
BETWEEN MD 218 AND MD 5	1.09	34.86	🟩	🟩	🟨	🟩	🟩	🟩	🟩	🟩
MERGE MD 5	0.72	35.95	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 5 AND MD 414	2.32	36.67	🟨	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 414	0.57	38.99	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 414 AND MD 210	0.83	39.56	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 210	1.64	40.39	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 210 AND I 295	0.07	42.03	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE I 295	0.19	42.10	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BEFORE WOODROW WILSON BRIDGE	0.12	42.29	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
WOODROW WILSON BRIDGE	1.18	42.41	🟩	🟨	🟩	🟩	🟩	🟩	🟩	🟩

Figure A.8: I-495 Outer Loop Heat Map Comparison (PM)

I-495 OL			MAY 2017 AVERAGE SPEEDS (MPH)				SIMULATED EXISTING SPEEDS (MPH)			
			HOURLY				HOURLY			
NAME	MILES	MILE POINT	3:00 PM	4:00 PM	5:00 PM	6:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
VA-193/GEORGETOWN PIKE/EXIT 13 (1)	0.43	0.00	🟨	🟧	🟧	🟨	🟥	🟥	🟥	🟧
VA-193/GEORGETOWN PIKE/EXIT 13 (2)	0.37	0.43	🟨	🟧	🟧	🟨	🟥	🟥	🟧	🟩
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	0.52	0.80	🟨	🟧	🟧	🟨	🟨	🟧	🟨	🟩
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	0.15	1.32	🟢	🟨	🟨	🟢	🟢	🟧	🟩	🟩
AMERICAN LEGION BRIDGE	0.16	1.47	🟢	🟧	🟨	🟢	🟢	🟨	🟩	🟩
BEFORE AMERICAN LEGION BRIDGE	0.10	1.63	🟢	🟨	🟨	🟨	🟢	🟢	🟢	🟢
MERGE CLARA BARTON PARKWAY	0.28	1.73	🟨	🟧	🟧	🟨	🟨	🟨	🟨	🟢
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	1.20	2.01	🟨	🟧	🟧	🟧	🟧	🟧	🟧	🟧
MERGE CABIN JOHN PARKWAY	0.45	3.21	🟧	🟥	🟥	🟧	🟧	🟥	🟥	🟥
BETWEEN CABIN JOHN PARKWAY AND MD 190	0.07	3.66	🟨	🟥	🟥	🟧	🟧	🟥	🟥	🟥
MERGE MD 190	0.30	3.73	🟨	🟥	🟥	🟧	🟧	🟥	🟥	🟥
BETWEEN MD 190 AND I 270	1.06	4.03	🟨	🟥	🟥	🟧	🟢	🟥	🟥	🟥
MERGE I 270	0.29	5.09	🟨	🟥	🟥	🟧	🟩	🟧	🟫	🟫
BETWEEN I 270 WEST AND MD 187	1.44	5.38	🟢	🟧	🟥	🟨	🟩	🟢	🟧	🟥
MERGE MD 187	0.36	6.82	🟢	🟨	🟧	🟢	🟩	🟩	🟢	🟧
BETWEEN I 270 EAST AND MD 187	0.58	7.18	🟩	🟢	🟨	🟢	🟩	🟩	🟩	🟢
MERGE BEFORE I 270	0.23	7.76	🟩	🟢	🟨	🟩	🟢	🟢	🟢	🟢
MERGE AFTER I 270	0.02	7.99	🟩	🟢	🟨	🟢	🟩	🟩	🟩	🟨
MD 355 MERGE	0.27	8.01	🟩	🟢	🟨	🟢	🟩	🟩	🟢	🟧
BETWEEN MD 355 AND MD 185	1.19	8.28	🟩	🟢	🟨	🟩	🟨	🟢	🟢	🟧
MD 185 MERGE	0.62	9.47	🟩	🟢	🟢	🟩	🟨	🟢	🟢	🟧
BETWEEN MD 185 AND MD 97	1.67	10.09	🟢	🟨	🟨	🟩	🟢	🟩	🟩	🟨
MD 97 MERGE	0.33	11.76	🟨	🟨	🟨	🟩	🟩	🟩	🟩	🟨
BETWEEN MD 97 AND US 29	1.12	12.09	🟧	🟧	🟨	🟩	🟩	🟩	🟢	🟢
MERGE US 29	0.22	13.21	🟧	🟧	🟨	🟩	🟩	🟩	🟢	🟢
BETWEEN MD US 29 AND MD 193	0.50	13.43	🟧	🟨	🟨	🟩	🟩	🟩	🟩	🟢
MERGE MD 193	0.26	13.93	🟨	🟨	🟢	🟩	🟩	🟩	🟩	🟢
BETWEEN MD 193 AND MD 650	1.20	14.19	🟧	🟨	🟢	🟩	🟩	🟩	🟢	🟩
MERGE MD 650	0.48	15.39	🟧	🟢	🟢	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 650 AND I 95	0.77	15.87	🟨	🟩	🟢	🟢	🟩	🟩	🟩	🟩
I 95 MERGE	0.85	16.64	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN US 1 AND I 95	0.58	17.49	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE US 1	0.52	18.07	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BETWEEN GREENBELT STATION AND US 1	0.78	18.59	🟩	🟩	🟩	🟩	🟨	🟨	🟨	🟨
BETWEEN GREENBELT STATION AND MD 201	0.88	19.37	🟢	🟢	🟨	🟨	🟧	🟧	🟧	🟧
MERGE MD 201	0.58	20.25	🟢	🟨	🟧	🟧	🟧	🟥	🟥	🟥
BETWEEN MD 201 AND MD 295 MERGE	0.38	20.83	🟢	🟨	🟧	🟧	🟧	🟥	🟥	🟥
MERGE MD 295	0.49	21.21	🟢	🟨	🟧	🟧	🟨	🟥	🟥	🟥
BETWEEN MD 295 AND MD 450	2.04	21.70	🟩	🟢	🟧	🟧	🟩	🟧	🟥	🟧
MERGE MD 450	0.36	23.74	🟩	🟢	🟧	🟧	🟩	🟢	🟥	🟥
BETWEEN MD 450 AND US 50	0.46	24.10	🟩	🟢	🟧	🟧	🟩	🟩	🟧	🟧
MERGE US 50	0.70	24.56	🟩	🟩	🟧	🟧	🟩	🟩	🟢	🟨
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	1.09	25.26	🟨	🟨	🟧	🟧	🟨	🟨	🟧	🟧
END 495 EXPRESS LANE	0.10	26.35	🟧	🟥	🟥	🟥	🟥	🟥	🟥	🟥
BEFORE MD 202 MERGE	0.20	26.45	🟧	🟧	🟥	🟧	🟫	🟥	🟫	🟫
MERGE MD 202	0.68	26.65	🟧	🟧	🟥	🟧	🟥	🟥	🟥	🟥
BETWEEN MD 202 AND ARENA DR	0.23	27.33	🟧	🟧	🟥	🟧	🟥	🟥	🟥	🟥
MERGE ARENA DR	0.46	27.56	🟨	🟨	🟧	🟨	🟥	🟥	🟥	🟥
BETWEEN ARENA DR AND MD 214	0.53	28.02	🟨	🟨	🟨	🟢	🟧	🟥	🟥	🟥
MERGE MD 214	0.50	28.55	🟢	🟢	🟢	🟢	🟨	🟥	🟥	🟥
BETWEEN MD 214 AND RITCHIE MARLBORO RD	1.18	29.05	🟢	🟨	🟢	🟢	🟢	🟧	🟧	🟨
MERGE RITCHIE MARLBORO RD	0.45	30.23	-	-	-	-	-	-	-	-
BETWEEN RITCHIE MARLBORO AND MD 4	1.87	30.68	-	-	-	-	-	-	-	-
MERGE MD 4	0.58	32.55	🟨	🟧	🟨	🟢	🟩	🟩	🟢	🟩
BETWEEN MD 4 AND FORESTVILLE RD	0.61	33.13	🟨	🟧	🟧	🟨	🟨	🟨	🟨	🟢
MERGE MD 337	0.17	33.74	🟧	🟥	🟧	🟨	🟧	🟥	🟥	🟨
BETWEEN FORESTVILLE AND MD 218	0.90	33.91	🟧	🟥	🟧	🟨	🟨	🟧	🟥	🟨
MERGE MD 218	0.05	34.81	🟧	🟧	🟧	🟨	🟩	🟨	🟧	🟢
BETWEEN MD 218 AND MD 5	1.09	34.86	🟨	🟧	🟧	🟨	🟩	🟢	🟢	🟢
MERGE MD 5	0.72	35.95	🟨	🟧	🟧	🟨	🟩	🟩	🟩	🟩
BETWEEN MD 5 AND MD 414	2.32	36.67	🟢	🟨	🟨	🟩	🟩	🟩	🟩	🟩
MERGE MD 414	0.57	38.99	🟢	🟢	🟢	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 414 AND MD 210	0.83	39.56	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE MD 210	1.64	40.39	🟢	🟩	🟢	🟩	🟩	🟩	🟩	🟩
BETWEEN MD 210 AND I 295	0.07	42.03	🟢	🟩	🟩	🟩	🟩	🟩	🟩	🟩
MERGE I 295	0.19	42.10	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
BEFORE WOODROW WILSON BRIDGE	0.12	42.29	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩
WOODROW WILSON BRIDGE	1.18	42.41	🟢	🟢	🟢	🟢	🟩	🟩	🟩	🟩

Appendix A.2: Speed and Travel Time Tables

Legend

🟩 Speed Within Acceptable Range

🟥 Speed Outside of Acceptable Range

Figure A.9: I-495 Inner Loop 7-8 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	7-8 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Inner Loop	228612	43.3				3945.8	3718.1	227.6	6%
VA-193 GEORGETOWN PIKE/EXIT 13	2729	0.5	25.7	55.4	No	72.3	33.6	38.7	54%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	2453	0.5	25.6	28.1	Yes	65.2	59.4	5.8	9%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	1935	0.4	30.7	20.7	Yes	42.9	63.7	-20.8	-48%
AMERICAN LEGION BRIDGE	794	0.2	38.9	26.7	Yes	13.9	20.2	-6.3	-46%
BEFORE AMERICAN LEGION BRIDGE	508	0.1	37.6	36.4	Yes	9.2	9.5	-0.3	-3%
MERGE CLARA BARTON PARKWAY	1055	0.2	43.3	52.1	Yes	16.6	13.8	2.8	17%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7287	1.4	53.0	55.9	Yes	93.7	88.9	4.8	5%
MERGE CABIN JOHN PARKWAY	2126	0.4	60.8	56.8	Yes	23.8	25.5	-1.7	-7%
BETWEEN CABIN JOHN PARKWAY AND MD 190	259	0.0	63.1	59.7	Yes	2.8	3.0	-0.2	-6%
MERGE MD 190	1235	0.2	63.5	56.5	Yes	13.3	14.9	-1.6	-12%
BETWEEN MD 190 AND I 270	6468	1.2	63.6	56.0	Yes	69.3	78.7	-9.4	-14%
MERGE I 270	867	0.2	59.9	57.4	Yes	9.9	10.3	-0.4	-4%
BETWEEN I 270 AND MD 187	7828	1.5	59.9	55.8	Yes	89.1	95.6	-6.5	-7%
MERGE MD 187	2140	0.4	60.5	54.2	Yes	24.1	26.9	-2.8	-12%
BETWEEN MD 187 AND I 270	2278	0.4	54.0	52.4	Yes	28.7	29.6	-0.9	-3%
MERGE BEFORE I 270	1306	0.2	47.9	50.4	Yes	18.6	17.7	0.9	5%
MERGE AFTER I 270	564	0.1	51.5	59.8	Yes	7.5	6.4	1.0	14%
MD 355 MERGE	1371	0.3	52.0	57.7	Yes	18.0	16.2	1.8	10%
BETWEEN MD 355 AND MD 185	6065	1.1	49.4	41.6	Yes	83.7	99.3	-15.5	-19%
MD 185 MERGE	2074	0.4	55.9	56.7	Yes	25.3	24.9	0.3	1%
BETWEEN MD 185 AND MD 97	9907	1.9	56.0	57.6	Yes	120.7	117.4	3.4	3%
MD 97 MERGE	1461	0.3	59.5	57.3	Yes	16.8	17.4	-0.6	-4%
BETWEEN MD 97 AND US 29	5965	1.1	60.4	58.8	Yes	67.3	69.2	-1.9	-3%
MERGE US 29	1734	0.3	60.9	59.7	Yes	19.4	19.8	-0.4	-2%
BETWEEN MD US 29 AND MD 193	1640	0.3	60.2	60.6	Yes	18.6	18.5	0.1	1%
MERGE MD 193	2099	0.4	61.7	58.4	Yes	23.2	24.5	-1.3	-6%
BETWEEN MD 193 AND MD 650	6046	1.1	62.3	56.9	Yes	66.2	72.4	-6.2	-9%
MERGE MD 650	3008	0.6	61.0	57.4	Yes	33.6	35.7	-2.1	-6%
BETWEEN MD 650 AND I 95	2869	0.5	60.5	59.2	Yes	32.3	33.0	-0.7	-2%
BEFORE I 95 MERGE	5612	1.1	62.5	61.2	Yes	61.2	62.5	-1.3	-2%
AFTER I 95 MERGE	2578	0.5	39.7	56.8	No	44.2	30.9	13.3	30%
MERGE US 1	2873	0.5	37.7	45.4	Yes	52.0	43.2	8.8	17%
BEFORE GREENBELT STATION MERGE	3544	0.7	45.1	38.0	Yes	53.6	63.6	-10.0	-19%
AFTER GREENBELT STATION MERGE	595	0.1	54.4	39.8	Yes	7.5	10.2	-2.7	-37%
BETWEEN GREENBELT STATION AND MD 201	4415	0.8	56.9	49.9	Yes	52.9	60.3	-7.4	-14%
MERGE MD 201	3066	0.6	56.8	52.5	Yes	36.8	39.8	-3.0	-8%
BETWEEN MD 201 AND MD 295 MERGE	1900	0.4	56.2	49.9	Yes	23.0	26.0	-2.9	-13%
MERGE MD 295	2725	0.5	60.2	54.1	Yes	30.8	34.4	-3.5	-11%
BETWEEN MD 295 AND MD 450	10677	2.0	62.0	54.2	Yes	117.3	134.3	-17.0	-14%
MERGE MD 450	1203	0.2	57.3	54.8	Yes	14.3	15.0	-0.7	-5%
BETWEEN MD 450 AND US 50	2809	0.5	54.6	50.5	Yes	35.1	37.9	-2.8	-8%
MERGE US 50	4270	0.8	54.7	56.8	Yes	53.2	51.3	1.9	4%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	5460	1.0	54.0	54.7	Yes	69.0	68.1	0.9	1%
END 495 EXPRESS LANE	515	0.1	61.7	55.1	Yes	5.7	6.4	-0.7	-12%
BEFORE MD 202 MERGE	1817	0.3	60.5	56.4	Yes	20.5	22.0	-1.5	-7%
MERGE MD 202	2462	0.5	60.2	57.4	Yes	27.9	29.2	-1.3	-5%
BETWEEN MD 202 AND ARENA DR	1355	0.3	58.3	55.6	Yes	15.9	16.6	-0.8	-5%
MERGE ARENA DR	2059	0.4	56.2	56.0	Yes	25.0	25.1	-0.1	0%
BETWEEN ARENA DR AND MD 214	3333	0.6	54.6	56.7	Yes	41.6	40.0	1.6	4%
MD 214 MERGE	2564	0.5	51.7	55.9	Yes	33.8	31.3	2.6	8%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	5923	1.1							
MERGE RITCHIE MARLBORO RD	3041	0.6							
BETWEEN RITCHIE MARLBORO AND MD 4	9698	1.8	55.4	53.0	Yes	119.4	124.9	-5.5	-5%
MERGE MD 4	2628	0.5	60.0	57.1	Yes	29.9	31.4	-1.5	-5%
BETWEEN MD 4 AND FORESTVILLE RD	3339	0.6	61.1	58.7	Yes	37.2	38.8	-1.5	-4%
MERGE FORESTVILLE RD	930	0.2	62.1	60.2	Yes	10.2	10.5	-0.3	-3%
BETWEEN FORESTVILLE AND MD 218	3213	0.6	62.4	62.8	Yes	35.1	34.9	0.2	1%
MERGE MD 218	1660	0.3	63.4	63.1	Yes	17.8	18.0	-0.1	-1%
BETWEEN MD 218 AND MD 5	6410	1.2	60.9	56.2	Yes	71.8	77.8	-6.0	-8%
MERGE MD 5	2751	0.5	32.0	27.5	Yes	58.7	68.2	-9.5	-16%
BETWEEN MD 5 AND MD 414	11958	2.3	18.2	14.2	Yes	447.5	575.5	-127.9	-29%
MERGE MD 414	3478	0.7	14.6	10.4	Yes	162.9	228.0	-65.0	-40%
BETWEEN MD 414 AND MD 210	2470	0.5	15.7	22.6	Yes	107.3	74.4	32.9	31%
MERGE MD 210	5648	1.1	7.7	21.3	Yes	500.4	180.9	319.5	64%
BETWEEN MD 210 AND I 295	2959	0.6	10.1	20.1	Yes	200.4	100.2	100.2	50%
MERGE I 295	3328	0.6	22.6	30.6	Yes	100.3	74.2	26.1	26%
BEFORE WOODROW WILSON BRIDGE	1217	0.2	48.8	56.8	Yes	17.0	14.6	2.4	14%
WOODROW WILSON BRIDGE	6059	1.1	50.2	57.5	Yes	82.4	71.9	10.5	13%

Figure A.10: I-495 Outer Loop 7-8 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	7-8 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Outer Loop	230042	43.6				4173.2	4148.3	24.9	1%
WOODROW WILSON BRIDGE	6160	1.2	49.3	57.4	Yes	85.3	73.1	12.1	14%
BEFORE WOODROW WILSON BRIDGE	644	0.1	53.6	60.2	Yes	8.2	7.3	0.9	11%
MERGE I 295	1023	0.2	59.4	59.0	Yes	11.7	11.8	-0.1	-1%
BETWEEN MD 210 AND I 295	377	0.1	57.3	60.6	Yes	4.5	4.2	0.2	5%
MERGE MD 210	8656	1.6	57.7	58.1	Yes	102.3	101.5	0.8	1%
BETWEEN MD 414 AND MD 210	4452	0.8	61.8	58.5	Yes	49.2	51.9	-2.7	-6%
MERGE MD 414	2984	0.6	62.8	59.0	Yes	32.4	34.5	-2.1	-7%
BETWEEN MD 5 AND MD 414	12214	2.3	60.0	53.0	Yes	138.9	157.2	-18.4	-13%
MERGE MD 5	3740	0.7	62.3	53.4	Yes	40.9	47.7	-6.8	-17%
BETWEEN MD 218 AND MD 5	5897	1.1	60.4	52.5	Yes	66.5	76.6	-10.1	-15%
MERGE MD 218	238	0.0	59.0	54.4	Yes	2.7	3.0	-0.2	-9%
BETWEEN FORESTVILLE AND MD 218	4910	0.9	57.0	54.4	Yes	58.7	61.6	-2.9	-5%
MERGE MD 337	912	0.2	55.2	54.7	Yes	11.3	11.4	-0.1	-1%
BETWEEN MD 4 AND FORESTVILLE RD	3145	0.6	52.0	52.4	Yes	41.2	40.9	0.3	1%
MERGE MD 4	3108	0.6	48.1	54.1	Yes	44.0	39.2	4.9	11%
BETWEEN RITCHIE MARLBORO AND MD 4	9857	1.9							
MERGE RITCHIE MARLBORO RD	2341	0.4							
BETWEEN MD 214 AND RITCHIE MARLBORO RD	6303	1.2	43.2	52.8	Yes	99.4	81.4	18.0	18%
MERGE MD 214	2618	0.5	41.8	55.4	Yes	42.7	32.2	10.5	25%
BETWEEN ARENA DR AND MD 214	2789	0.5	41.4	51.3	Yes	46.0	37.1	8.9	19%
MERGE ARENA DR	2437	0.5	39.8	47.1	Yes	41.7	35.3	6.5	15%
BETWEEN MD 202 AND ARENA DR	1179	0.2	33.3	35.2	Yes	24.1	22.9	1.3	5%
MERGE MD 202	3055	0.6	27.7	22.4	Yes	75.2	93.1	-17.9	-24%
BEFORE MD 202 MERGE	908	0.2	28.2	11.3	No	22.0	54.6	-32.6	-148%
END 495 EXPRESS LANE	594	0.1	24.5	14.5	Yes	16.5	27.9	-11.4	-69%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	6101	1.2	33.3	40.0	Yes	124.9	104.1	20.8	17%
MERGE US 50	3680	0.7	37.7	54.8	No	66.5	45.8	20.7	31%
BETWEEN MD 450 AND US 50	2561	0.5	32.2	28.8	Yes	54.2	60.6	-6.4	-12%
MERGE MD 450	2100	0.4	37.4	27.4	Yes	38.3	52.3	-14.0	-36%
BETWEEN MD 295 AND MD 450	10674	2.0	51.0	46.2	Yes	142.7	157.6	-14.9	-10%
MERGE MD 295	2479	0.5	54.1	52.4	Yes	31.2	32.2	-1.0	-3%
BETWEEN MD 201 AND MD 295 MERGE	1996	0.4	56.1	51.5	Yes	24.2	26.4	-2.2	-9%
MERGE MD 201	3054	0.6	59.2	51.8	Yes	35.2	40.2	-5.1	-14%
BETWEEN GREENBELT STATION AND MD 201	4643	0.9	59.2	52.7	Yes	53.4	60.0	-6.6	-12%
BETWEEN GREENBELT STATION AND US 1	4102	0.8	58.3	56.9	Yes	48.0	49.2	-1.2	-2%
MERGE US 1	2739	0.5	51.8	57.8	Yes	36.1	32.3	3.8	11%
BETWEEN US 1 AND I 95	3225	0.6	42.2	56.7	No	52.1	38.8	13.3	26%
I 95 MERGE	4389	0.8	11.3	54.9	No	265.4	54.5	210.9	79%
BETWEEN MD 650 AND I 95	4048	0.8	9.8	11.0	Yes	283.0	251.1	31.9	11%
MERGE MD 650	2547	0.5	9.6	9.6	Yes	181.2	181.1	0.1	0%
BETWEEN MD 193 AND MD 650	6315	1.2	11.1	11.0	Yes	387.9	390.5	-2.6	-1%
MERGE MD 193	1353	0.3	13.5	11.8	Yes	68.2	78.0	-9.8	-14%
BETWEEN MD US 29 AND MD 193	2722	0.5	14.3	15.2	Yes	129.6	121.8	7.8	6%
MERGE US 29	1127	0.2	15.3	13.9	Yes	50.3	55.4	-5.1	-10%
BETWEEN MD 97 AND US 29	5926	1.1	21.1	19.1	Yes	191.4	211.4	-20.0	-10%
MD 97 MERGE	1734	0.3	24.9	16.3	Yes	47.5	72.4	-24.9	-52%
BETWEEN MD 185 AND MD 97	8746	1.7	41.0	31.7	Yes	145.4	188.2	-42.8	-29%
MD 185 MERGE	3315	0.6	45.4	53.0	Yes	49.8	42.6	7.1	14%
BETWEEN MD 355 AND MD 185	6287	1.2	52.7	51.5	Yes	81.3	83.3	-1.9	-2%
MD 355 MERGE	1401	0.3	56.8	53.2	Yes	16.8	17.9	-1.1	-7%
MERGE AFTER I 270	61	0.0	56.4	54.1	Yes	0.7	0.8	0.0	-4%
MERGE BEFORE I 270	1298	0.2	55.1	49.2	Yes	16.1	18.0	-1.9	-12%
BETWEEN I 270 EAST AND MD 187	3092	0.6	56.7	53.3	Yes	37.2	39.6	-2.4	-7%
MERGE MD 187	1936	0.4	59.2	52.6	Yes	22.3	25.1	-2.8	-13%
BETWEEN I 270 WEST AND MD 187	7643	1.4	60.2	52.8	Yes	86.5	98.7	-12.1	-14%
MERGE I 270	1490	0.3	54.1	50.8	Yes	18.8	20.0	-1.2	-7%
BETWEEN MD 190 AND I 270	5753	1.1	54.3	42.1	Yes	72.2	93.2	-21.0	-29%
MERGE MD 190	1537	0.3	57.5	51.9	Yes	18.2	20.2	-2.0	-11%
BETWEEN CABIN JOHN PARKWAY AND MD 190	214	0.0	57.2	51.4	Yes	2.6	2.8	-0.3	-11%
MERGE CABIN JOHN PARKWAY	2397	0.5	55.8	44.3	Yes	29.3	36.9	-7.6	-26%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	6336	1.2	56.2	42.5	Yes	76.8	101.5	-24.7	-32%
MERGE CLARA BARTON PARKWAY	1463	0.3	57.9	49.6	Yes	17.2	20.1	-2.9	-17%
BEFORE AMERICAN LEGION BRIDGE	746	0.1	57.8	52.0	Yes	8.8	9.8	-1.0	-11%
AMERICAN LEGION BRIDGE	790	0.1	57.2	53.0	Yes	9.4	10.2	-0.7	-8%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	843	0.2	56.5	52.1	Yes	10.2	11.0	-0.8	-8%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	4288	0.8	58.6	52.4	Yes	49.9	55.8	-5.9	-12%
VA-193/GEORGETOWN PIKE/EXIT 13 (2)	679	0.1	59.6	52.8	Yes	7.8	8.8	-1.0	-13%
VA-193/GEORGETOWN PIKE/EXIT 13 (1)	1669	0.3	59.4	52.6	Yes	19.2	21.6	-2.5	-13%

Figure A.11: I-270 Southbound 7-8 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	7-8 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 SB	176479	33.4				3945.8	4280.1	-334.3	-8%
BETWEEN MD-85 ON AND OFF RAMPS	2549	0.5	55.3	57.5	Yes	31.4	30.2	1.2	4%
FROM MD-85 ON RAMP TO MD-80	25540	4.8	34.8	44.4	Yes	499.7	391.9	107.8	22%
BETWEEN MD-80 ON AND OFF RAMPS	845	0.2	24.4	19.2	Yes	23.6	30.1	-6.4	-27%
FROM MD-80 ON RAMP TO MD-109	18767	3.6	33.4	24.5	Yes	382.6	522.7	-140.1	-37%
BETWEEN MD-109 ON AND OFF RAMPS	922	0.2	31.0	22.7	Yes	20.3	27.7	-7.4	-37%
FROM MD-109 ON RAMP TO MD-121	18329	3.5	45.8	45.2	Yes	273.1	276.3	-3.2	-1%
BETWEEN MD-121 ON AND OFF RAMPS	2354	0.4	39.8	52.7	Yes	40.4	30.5	9.9	24%
FROM MD-121 TO MD-27	10608	2.0	29.9	32.9	Yes	242.1	220.1	22.0	9%
BETWEEN MD-27 ON AND OFF RAMPS	3802	0.7	15.8	12.5	Yes	163.7	206.6	-42.9	-26%
FROM MD-27 ON RAMP TO MD-118	1852	0.4	16.6	12.3	Yes	76.0	102.8	-26.8	-35%
BETWEEN MD-118 ON AND OFF RAMPS	3278	0.6	17.8	14.6	Yes	125.7	153.0	-27.3	-22%
FROM MD-118 ON RAMP TO MIDDLEBROOK RD	2587	0.5	23.1	26.0	Yes	76.2	67.7	8.5	11%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMPS	1460	0.3	26.3	31.7	Yes	37.9	31.4	6.5	17%
FROM MIDDLEBROOK RD ON RAMP TO MD-124	10210	1.9	27.5	26.0	Yes	253.0	267.8	-14.8	-6%
BETWEEN MD-124 ON AND OFF RAMPS	1613	0.3	25.2	17.3	Yes	43.6	63.5	-19.9	-46%
FROM MD-124 ON RAMP TO MD-117	3042	0.6	29.6	22.0	Yes	70.0	94.4	-24.3	-35%
BETWEEN MD-117 ON AND OFF RAMPS	1463	0.3	34.6	30.4	Yes	28.9	32.8	-4.0	-14%
FROM MD-117 TO I-370 INTERCHANGE	3727	0.7	38.0	33.0	Yes	66.9	77.0	-10.1	-15%
BETWEEN I-370 ON AND OFF RAMPS	3154	0.6	29.6	27.1	Yes	72.5	79.3	-6.8	-9%
FROM I-370 ON RAMP TO SHADY GROVE RD	4729	0.9	18.4	15.1	Yes	174.8	213.2	-38.3	-22%
BETWEEN SHADY GROVE RD ON AND OFF RAMPS	77	0.0	21.0	28.3	Yes	2.5	1.9	0.6	26%
FROM SHADY GROVE RD ON RAMP TO MD-28	9889	1.9	19.6	26.4	Yes	344.3	255.8	88.5	26%
BETWEEN MD-28 ON AND OFF RAMPS	52	0.0	27.7	29.6	Yes	1.3	1.2	0.1	7%
FROM MD-28 ON RAMP TO MD-189	4132	0.8	29.6	22.6	Yes	95.1	124.5	-29.4	-31%
BETWEEN MD-189 ON AND OFF RAMPS	3083	0.6	26.0	18.2	Yes	80.9	115.6	-34.7	-43%
FROM MD-189 ON RAMP TO MONTROSE RD	3383	0.6	22.5	17.5	Yes	102.7	131.9	-29.3	-29%
BETWEEN MONTROSE RD ON AND OFF RAMPS	4822	0.9	28.1	20.3	Yes	116.9	162.3	-45.4	-39%
FROM MONTROSE RD ON RAMP TO I-270 SPUR	6153	1.2	40.6	28.0	Yes	103.4	149.8	-46.4	-45%
FROM I-270 SPUR MD-187	1248	0.2	56.5	57.4	Yes	15.1	14.8	0.2	2%
BETWEEN MD-187 SPUR ON AND OFF RAMPS	4256	0.8	60.6	62.6	Yes	47.9	46.3	1.6	3%
FROM MD-187 ON RAMP TO I-495 INTERCHANGE	6196	1.2	58.7	61.6	Yes	71.9	68.6	3.4	5%
BETWEEN I-495 INTERCHANGE ON AND OFF RAMPS	1395	0.3	52.4	62.7	Yes	18.2	15.2	3.0	16%
I-270 SPUR MERGE	1150	0.2	25.2	21.9	Yes	31.1	35.8	-4.6	-15%
BETWEEN US-1 AND I-270 SPUR MERGE	2883	0.5	29.9	22.5	Yes	65.8	87.2	-21.4	-33%
MERGE US-1	2749	0.5	32.9	28.4	Yes	57.0	66.0	-9.0	-16%
MERGE I-495	4180	0.8	31.9	33.8	Yes	89.3	84.3	5.0	6%

Figure A.12: I-270 Northbound 7-8 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	7-8 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 NB	177527	33.6				1854.7	1919.5	-64.8	-3%
BETWEEN MD-355 AND GROSVENOR LANE	1044	0.2	53.9	60.9	No	13.2	11.7	1.5	12%
FROM GROSVENOR LANE TO EXIT 1A	6217	1.2	58.4	62.8	Yes	72.5	67.5	5.1	7%
BETWEEN EXIT 1A AND 1B	4042	0.8	60.6	63.9	Yes	45.5	43.1	2.4	5%
FROM MD-187 TO I-270 SPUR	341	0.1	60.7	63.0	Yes	3.8	3.7	0.1	4%
FROM TUCKERMAN LANE TO I-270 LOCAL	7876	1.3	63.0	63.2	Yes	76.6	76.3	0.3	0%
FROM I-270 LOCAL TO EXIT 5 FOR I-270 LOCAL	5080	1.0	66.6	62.7	Yes	52.0	55.3	-3.3	-6%
FROM EXIT 5 FOR I-270 LOCAL TO JUST SOUTH OF MD-189	3227	0.6	65.8	63.2	Yes	33.4	34.8	-1.4	-4%
BETWEEN MD-189 ON AND OFF RAMPS	3080	0.6	66.4	63.4	Yes	31.6	33.1	-1.5	-5%
FROM MD-189 TO JUST SOUTH OF MD-28	4076	0.8	66.4	63.3	Yes	41.9	43.9	-2.1	-5%
BETWEEN MD-28 ON AND OFF RAMPS	49	0.0	66.3	62.9	Yes	0.5	0.5	0.0	-5%
FROM MD-28 ON RAMP TO REDLAND BLVD	10016	1.9	65.8	64.0	Yes	103.7	106.7	-3.0	-3%
BETWEEN SHADY GROVE RD ON AND OFF RAMPS	74	0.0	66.9	63.6	Yes	0.8	0.8	0.0	-5%
FROM SHADY GROVE RD ON RAMP TO I-370 INTERCHANGE	4827	0.9	67.4	63.8	Yes	48.8	51.6	-2.8	-6%
FROM I-370 INTERCHANGE TO MUDDY BRANCH RD	172	0.0	67.6	64.0	Yes	1.7	1.8	-0.1	-6%
FROM MUDDY BRANCH RD TO JUST SOUTH OF MD-117 INTERCHANGE	7943	1.5	66.7	63.0	Yes	81.2	85.9	-4.7	-6%
FROM JUST SOUTH OF MD-117 INTERCHANGE TO MD-117	29	0.0	66.6	63.2	Yes	0.3	0.3	0.0	-5%
FROM MD-117 TO MD-124 OFF RAMP	3249	0.6	66.9	63.2	Yes	33.1	35.1	-1.9	-6%
BETWEEN MD-124 ON AND OFF RAMPS	27	0.0	66.8	64.0	Yes	0.3	0.3	0.0	-4%
FROM MD-124 ON RAMP TO JUST SOUTH OF MIDDLEBROOK RD	12046	2.3	66.2	63.5	Yes	124.0	129.3	-5.3	-4%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMPS	1221	0.2	65.0	63.8	Yes	12.8	13.0	-0.2	-2%
FROM MIDDLEBROOK RD ON RAMP TO MD-118 OFF RAMP	2423	0.5	64.4	63.5	Yes	25.7	26.0	-0.3	-1%
BETWEEN MD-118 ON AND OFF RAMPS	3423	0.6	64.7	63.2	Yes	36.1	36.9	-0.8	-2%
FROM MD-118 ON RAMP TO MD-27	1487	0.3	64.5	63.2	Yes	15.7	16.1	-0.3	-2%
BETWEEN MD-27 ON AND OFF RAMPS	3356	0.6	65.9	63.6	Yes	34.7	36.0	-1.3	-4%
FROM MD-27 ON RAMP TO MD-121 OFF RAMP	11527	2.2	64.8	63.5	Yes	121.3	123.8	-2.5	-2%
BETWEEN MD-121 ON AND OFF RAMPS	959	0.2	64.9	62.9	Yes	10.1	10.4	-0.3	-3%
FROM MD-121 TO MD-109	20431	3.9	66.8	63.2	Yes	208.7	220.4	-11.8	-6%
BETWEEN MD-109 ON AND OFF RAMPS	920	0.2	65.2	64.6	Yes	9.6	9.7	-0.1	-1%
FROM MD-109 ON RAMP TO MD-80	18686	3.5	66.6	62.5	Yes	191.4	203.8	-12.4	-6%
BETWEEN MD-80 ON AND OFF RAMPS	946	0.2	66.0	60.9	Yes	9.8	10.6	-0.8	-8%
FROM MD-80 ON RAMP TO MD-85	24888	4.7	66.3	62.8	Yes	255.9	270.3	-14.4	-6%
BETWEEN MD-85 ON AND OFF RAMPS	2482	0.5	61.5	63.1	Yes	27.5	26.8	0.7	2%
MERGE FROM I 495	4953	0.9	62.7	59.6	Yes	53.9	56.6	-2.8	-5%
MERGE US-1	2620	0.5	63.8	63.4	Yes	28.0	28.2	-0.2	-1%
BETWEEN I-270 SPUR MERGE AND US 1	2977	0.6	64.2	63.7	Yes	31.6	31.8	-0.2	-1%
MERGE I-270 SPUR	1612	0.3	64.8	63.3	Yes	17.0	17.4	-0.4	-2%

Figure A.13: I-495 Inner Loop 8-9 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	8-9 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Inner Loop	**228612**	**43.3**				**3969.6**	**3711.1**	**258.4**	7%
VA-193/GEORGETOWN PIKE/EXIT 13	2729	0.5	17.1	20.3	Yes	108.9	91.8	17.0	16%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	2453	0.5	18.3	10.2	Yes	91.5	163.9	-72.4	-79%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	1935	0.4	25.8	16.4	Yes	51.1	80.2	-29.1	-57%
AMERICAN LEGION BRIDGE	794	0.2	35.9	26.0	Yes	15.1	20.8	-5.8	-38%
BEFORE AMERICAN LEGION BRIDGE	508	0.1	35.5	36.1	Yes	9.7	9.6	0.2	2%
MERGE CLARA BARTON PARKWAY	1055	0.2	42.7	52.0	Yes	16.9	13.8	3.0	18%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7287	1.4	52.6	55.6	Yes	94.5	89.3	5.2	5%
MERGE CABIN JOHN PARKWAY	2126	0.4	58.4	56.6	Yes	24.8	25.6	-0.8	-3%
BETWEEN CABIN JOHN PARKWAY AND MD 190	259	0.0	59.9	59.6	Yes	2.9	3.0	0.0	-1%
MERGE MD 190	1235	0.2	60.0	56.4	Yes	14.0	14.9	-0.9	-6%
BETWEEN MD 190 AND I 270	6468	1.2	59.8	54.5	Yes	73.8	80.9	-7.2	-10%
MERGE I 270	867	0.2	58.6	57.8	Yes	10.1	10.2	-0.1	-1%
BETWEEN I 270 AND MD 187	7828	1.5	59.0	56.3	Yes	90.4	94.7	-4.3	-5%
MERGE MD 187	2140	0.4	58.2	56.0	Yes	25.1	26.1	-1.0	-4%
BETWEEN MD 187 AND I 270	2278	0.4	49.4	55.6	Yes	31.5	27.9	3.5	11%
MERGE BEFORE I 270	1306	0.2	48.3	51.7	Yes	18.4	17.2	1.2	7%
MERGE AFTER I 270	564	0.1	47.0	60.8	Yes	8.2	6.3	1.9	23%
MD 355 MERGE	1371	0.3	45.4	55.6	Yes	20.6	16.8	3.8	18%
BETWEEN MD 355 AND MD 185	6065	1.1	38.6	44.8	Yes	107.2	92.2	15.0	14%
MD 185 MERGE	2074	0.4	48.5	57.7	Yes	29.2	24.5	4.7	16%
BETWEEN MD 185 AND MD 97	9907	1.9	47.5	57.7	Yes	142.1	117.0	25.1	18%
MD 97 MERGE	1461	0.3	56.1	58.0	Yes	17.8	17.2	0.6	3%
BETWEEN MD 97 AND US 29	5965	1.1	58.0	59.2	Yes	70.1	68.7	1.4	2%
MERGE US 29	1734	0.3	60.0	59.6	Yes	19.7	19.8	-0.1	-1%
BETWEEN MD US 29 AND MD 193	1640	0.3	59.3	60.7	Yes	18.9	18.4	0.4	2%
MERGE MD 193	2099	0.4	60.3	58.3	Yes	23.7	24.5	-0.8	-3%
BETWEEN MD 193 AND MD 650	6046	1.1	60.2	54.5	Yes	68.5	75.6	-7.1	-10%
MERGE MD 650	3008	0.6	59.5	57.6	Yes	34.5	35.6	-1.1	-3%
BETWEEN MD 650 AND I 95	2869	0.5	59.9	60.0	Yes	32.6	32.6	0.1	0%
BEFORE I 95 MERGE	5612	1.1	58.1	61.6	Yes	65.8	62.1	3.7	6%
AFTER I 95 MERGE	2578	0.5	26.2	40.0	Yes	67.0	43.9	23.1	34%
MERGE US 1	2873	0.5	25.9	32.9	Yes	75.7	59.5	16.3	21%
BEFORE GREENBELT STATION MERGE	3544	0.7	34.4	35.0	Yes	70.2	69.1	1.1	2%
AFTER GREENBELT STATION MERGE	595	0.1	49.6	38.1	Yes	8.2	10.7	-2.5	-30%
BETWEEN GREENBELT STATION AND MD 201	4415	0.8	54.4	49.5	Yes	55.3	60.8	-5.5	-10%
MERGE MD 201	3066	0.6	54.8	51.1	Yes	38.2	40.9	-2.7	-7%
BETWEEN MD 201 AND MD 295 MERGE	1900	0.4	54.2	44.5	Yes	23.9	29.1	-5.2	-22%
MERGE MD 295	2725	0.5	58.1	53.0	Yes	32.0	35.1	-3.1	-10%
BETWEEN MD 295 AND MD 450	10677	2.0	59.3	53.5	Yes	122.8	136.2	-13.4	-11%
MERGE MD 450	1203	0.2	53.7	51.5	Yes	15.3	15.9	-0.6	-4%
BETWEEN MD 450 AND US 50	2809	0.5	52.9	43.5	Yes	36.2	44.0	-7.8	-22%
MERGE US 50	4270	0.8	53.5	56.2	Yes	54.4	51.8	2.6	5%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	5460	1.0	50.6	52.4	Yes	73.5	71.0	2.5	3%
END 495 EXPRESS LANE	515	0.1	61.8	54.2	Yes	5.7	6.5	-0.8	-14%
BEFORE MD 202 MERGE	1817	0.3	60.7	55.4	Yes	20.4	22.4	-1.9	-10%
MERGE MD 202	2462	0.5	60.7	56.7	Yes	27.6	29.6	-2.0	-7%
BETWEEN MD 202 AND ARENA DR	1355	0.3	59.5	54.7	Yes	15.5	16.9	-1.4	-9%
MERGE ARENA DR	2059	0.4	56.2	55.2	Yes	25.0	25.4	-0.4	-2%
BETWEEN ARENA DR AND MD 214	3333	0.6	50.9	56.2	Yes	44.7	40.4	4.2	9%
MD 214 MERGE	2564	0.5	44.0	55.4	Yes	39.8	31.6	8.2	21%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	5923	1.1							
MERGE RITCHIE MARLBORO RD	3041	0.6							
BETWEEN RITCHIE MARLBORO AND MD 4	9698	1.8	42.6	55.7	Yes	155.3	118.7	36.6	24%
MERGE MD 4	2628	0.5	49.3	56.8	Yes	36.3	31.5	4.8	13%
BETWEEN MD 4 AND FORESTVILLE RD	3339	0.6	53.1	57.6	Yes	42.9	39.5	3.3	8%
MERGE FORESTVILLE RD	930	0.2	59.7	59.4	Yes	10.6	10.7	-0.1	-1%
BETWEEN FORESTVILLE AND MD 218	3213	0.6	60.7	62.5	Yes	36.1	35.0	1.1	3%
MERGE MD 218	1660	0.3	61.9	62.9	Yes	18.3	18.0	0.3	2%
BETWEEN MD 218 AND MD 5	6410	1.2	61.0	43.5	No	71.7	100.4	-28.8	-40%
MERGE MD 5	2751	0.5	37.2	19.0	No	50.5	98.8	-48.3	-96%
BETWEEN MD 5 AND MD 414	11958	2.3	20.0	18.3	Yes	407.2	446.3	-39.1	-10%
MERGE MD 414	3478	0.7	15.6	18.1	Yes	151.7	131.0	20.7	14%
BETWEEN MD 414 AND MD 210	2470	0.5	18.6	29.9	Yes	90.3	56.3	34.1	38%
MERGE MD 210	5648	1.1	11.3	28.3	No	339.8	135.9	203.9	60%
BETWEEN MD 210 AND I 295	2959	0.6	12.9	19.7	Yes	156.3	102.5	53.7	34%
MERGE I 295	3328	0.6	23.0	29.3	Yes	98.6	77.4	21.2	22%
BEFORE WOODROW WILSON BRIDGE	1217	0.2	41.4	56.4	No	20.0	14.7	5.3	27%
WOODROW WILSON BRIDGE	6059	1.1	43.5	57.4	Yes	95.0	71.9	23.1	24%

Figure A.14: I-495 Outer Loop 8-9 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	8-9 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Outer Loop	230042	43.6				4792.2	4275.8	516.4	11%
WOODROW WILSON BRIDGE	6160	1.2	56.7	56.9	Yes	74.1	73.8	0.3	0%
BEFORE WOODROW WILSON BRIDGE	644	0.1	57.1	60.1	Yes	7.7	7.3	0.4	5%
MERGE I 295	1023	0.2	59.9	59.0	Yes	11.6	11.8	-0.2	-2%
BETWEEN MD 210 AND I 295	377	0.1	57.9	60.6	Yes	4.4	4.2	0.2	4%
MERGE MD 210	8656	1.6	59.5	58.2	Yes	99.2	101.5	-2.2	-2%
BETWEEN MD 414 AND MD 210	4452	0.8	61.7	58.6	Yes	49.2	51.8	-2.7	-5%
MERGE MD 414	2984	0.6	63.8	59.2	Yes	31.9	34.4	-2.5	-8%
BETWEEN MD 5 AND MD 414	12214	2.3	64.5	53.0	Yes	129.2	157.0	-27.9	-22%
MERGE MD 5	3740	0.7	60.2	52.9	Yes	42.3	48.3	-5.9	-14%
BETWEEN MD 218 AND MD 5	5897	1.1	48.0	53.0	Yes	83.8	75.9	7.9	9%
MERGE MD 218	238	0.0	44.7	55.2	Yes	3.6	2.9	0.7	19%
BETWEEN FORESTVILLE AND MD 218	4910	0.9	41.3	54.6	Yes	81.1	61.3	19.9	25%
MERGE MD 337	912	0.2	38.9	54.9	No	16.0	11.3	4.7	29%
BETWEEN MD 4 AND FORESTVILLE RD	3145	0.6	40.6	53.3	Yes	52.8	40.2	12.6	24%
MERGE MD 4	3108	0.6	39.5	54.6	No	53.6	38.8	14.8	28%
BETWEEN RITCHIE MARLBORO AND MD 4	9857	1.9							
MERGE RITCHIE MARLBORO RD	2341	0.4							
BETWEEN MD 214 AND RITCHIE MARLBORO RD	6303	1.2	40.5	45.3	Yes	106.0	94.9	11.2	11%
MERGE MD 214	2618	0.5	39.5	33.1	Yes	45.2	53.9	-8.8	-19%
BETWEEN ARENA DR AND MD 214	2789	0.5	39.0	25.3	Yes	48.7	75.2	-26.5	-54%
MERGE ARENA DR	2437	0.5	35.0	27.6	Yes	47.4	60.2	-12.8	-27%
BETWEEN MD 202 AND ARENA DR	1179	0.2	26.1	25.7	Yes	30.8	31.3	-0.5	-2%
MERGE MD 202	3055	0.6	22.1	21.0	Yes	94.0	99.1	-5.1	-5%
BEFORE MD 202 MERGE	908	0.2	23.8	10.7	Yes	26.0	57.8	-31.8	-123%
END 495 EXPRESS LANE	594	0.1	20.0	14.4	Yes	20.2	28.2	-8.0	-39%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	6101	1.2	30.4	39.7	Yes	136.9	104.7	32.2	24%
MERGE US 50	3680	0.7	34.8	56.7	No	72.2	44.3	27.9	39%
BETWEEN MD 450 AND US 50	2561	0.5	29.2	28.8	Yes	59.7	60.6	-0.9	-2%
MERGE MD 450	2100	0.4	33.4	28.2	Yes	42.9	50.8	-7.9	-18%
BETWEEN MD 295 AND MD 450	10674	2.0	47.9	45.8	Yes	151.9	158.8	-6.9	-5%
MERGE MD 295	2479	0.5	54.8	52.8	Yes	30.9	32.0	-1.2	-4%
BETWEEN MD 201 AND MD 295 MERGE	1996	0.4	57.5	51.9	Yes	23.7	26.2	-2.6	-11%
MERGE MD 201	3054	0.6	61.7	52.5	Yes	33.8	39.7	-5.9	-18%
BETWEEN GREENBELT STATION AND MD 201	4643	0.9	61.9	52.9	Yes	51.1	59.8	-8.7	-17%
BETWEEN GREENBELT STATION AND US 1	4102	0.8	57.2	57.2	Yes	48.9	48.9	0.0	0%
MERGE US 1	2739	0.5	52.2	57.9	Yes	35.8	32.3	3.5	10%
BETWEEN US 1 AND I 95	3225	0.6	45.8	56.8	Yes	48.0	38.7	9.3	19%
I 95 MERGE	4389	0.8	10.5	58.1	No	285.7	51.5	234.2	82%
BETWEEN MD 650 AND I 95	4048	0.8	8.3	12.5	Yes	334.3	221.5	112.8	34%
MERGE MD 650	2547	0.5	7.7	9.7	Yes	226.8	179.7	47.1	21%
BETWEEN MD 193 AND MD 650	6315	1.2	8.5	10.5	Yes	507.0	410.5	96.5	19%
MERGE MD 193	1353	0.3	10.4	11.4	Yes	88.3	81.1	7.3	8%
BETWEEN MD US 29 AND MD 193	2722	0.5	11.5	14.4	Yes	161.9	129.0	32.9	20%
MERGE US 29	1127	0.2	12.7	13.1	Yes	60.6	58.8	1.9	3%
BETWEEN MD 97 AND US 29	5926	1.1	17.9	17.9	Yes	226.3	226.4	-0.1	0%
MD 97 MERGE	1734	0.3	21.3	15.6	Yes	55.4	75.6	-20.2	-36%
BETWEEN MD 185 AND MD 97	8746	1.7	40.2	32.4	Yes	148.3	184.2	-35.9	-24%
MD 185 MERGE	3315	0.6	46.2	52.8	Yes	48.9	42.8	6.2	13%
BETWEEN MD 355 AND MD 185	6287	1.2	49.9	44.4	Yes	85.9	96.6	-10.7	-12%
MD 355 MERGE	1401	0.3	53.4	52.9	Yes	17.9	18.1	-0.2	-1%
MERGE AFTER I 270	61	0.0	53.1	54.1	Yes	0.8	0.8	0.0	2%
MERGE BEFORE I 270	1298	0.2	52.1	49.5	Yes	17.0	17.9	-0.9	-5%
BETWEEN I 270 EAST AND MD 187	3092	0.6	52.8	53.5	Yes	39.9	39.4	0.5	1%
MERGE MD 187	1936	0.4	50.5	52.8	Yes	26.1	25.0	1.1	4%
BETWEEN I 270 WEST AND MD 187	7643	1.4	48.1	53.0	Yes	108.4	98.3	10.1	9%
MERGE I 270	1490	0.3	39.2	51.6	Yes	25.9	19.7	6.2	24%
BETWEEN MD 190 AND I 270	5753	1.1	40.2	44.2	Yes	97.6	88.7	8.9	9%
MERGE MD 190	1537	0.3	39.6	52.1	Yes	26.4	20.1	6.3	24%
BETWEEN CABIN JOHN PARKWAY AND MD 190	214	0.0	39.4	51.4	Yes	3.7	2.8	0.9	23%
MERGE CABIN JOHN PARKWAY	2397	0.5	36.8	50.8	Yes	44.4	32.2	12.2	28%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	6336	1.2	43.0	44.0	Yes	100.5	98.3	2.3	2%
MERGE CLARA BARTON PARKWAY	1463	0.3	48.1	48.6	Yes	20.7	20.5	0.2	1%
BEFORE AMERICAN LEGION BRIDGE	746	0.1	50.3	51.1	Yes	10.1	9.9	0.2	2%
AMERICAN LEGION BRIDGE	790	0.1	47.5	52.4	Yes	11.3	10.3	1.1	9%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	843	0.2	47.1	51.9	Yes	12.2	11.1	1.1	9%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	4288	0.8	42.9	52.3	Yes	68.2	55.9	12.2	18%
VA-193/GEORGETOWN PIKE/EXIT 13 (2)	679	0.1	40.3	52.8	Yes	11.5	8.8	2.7	24%
VA-193/GEORGETOWN PIKE/EXIT 13 (1)	1669	0.3	45.2	50.6	Yes	25.2	22.5	2.7	11%

Figure A.15: I-270 Southbound 8-9 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	8-9 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 SB	176479	33.4				3704.4	3645.4	59.0	2%
BETWEEN MD-85 ON AND OFF RAMPS	2549	0.5	58.6	57.5	Yes	29.7	30.2	-0.6	-2%
FROM MD-85 ON RAMP TO MD-80	25540	4.8	50.6	34.6	Yes	344.3	503.6	-159.3	-46%
BETWEEN MD-80 ON AND OFF RAMPS	845	0.2	36.3	16.3	No	15.9	35.3	-19.5	-123%
FROM MD-80 ON RAMP TO MD-109	18767	3.6	40.9	24.4	Yes	313.1	524.0	-210.8	-67%
BETWEEN MD-109 ON AND OFF RAMPS	922	0.2	36.2	23.0	Yes	17.3	27.4	-10.0	-58%
FROM MD-109 ON RAMP TO MD-121	18329	3.5	46.0	44.9	Yes	271.5	278.4	-6.9	-3%
BETWEEN MD-121 ON AND OFF RAMPS	2354	0.4	39.7	48.7	Yes	40.5	32.9	7.6	19%
FROM MD-121 TO MD-27	10608	2.0	29.4	35.9	Yes	245.9	201.3	44.6	18%
BETWEEN MD-27 ON AND OFF RAMPS	3802	0.7	18.3	27.3	Yes	141.9	94.8	47.1	33%
FROM MD-27 ON RAMP TO MD-118	1852	0.4	19.9	26.4	Yes	63.6	47.8	15.8	25%
BETWEEN MD-118 ON AND OFF RAMPS	3278	0.6	21.2	25.6	Yes	105.5	87.3	18.2	17%
FROM MD-118 ON RAMP TO MIDDLEBROOK RD	2587	0.5	28.3	38.1	Yes	62.3	46.3	16.0	26%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMPS	1460	0.3	33.2	46.0	Yes	30.0	21.6	8.4	28%
FROM MIDDLEBROOK RD ON RAMP TO MD-124	10210	1.9	32.1	34.0	Yes	217.1	204.7	12.4	6%
BETWEEN MD-124 ON AND OFF RAMPS	1613	0.3	27.8	17.8	Yes	39.6	61.8	-22.2	-56%
FROM MD-124 ON RAMP TO MD-117	3042	0.6	32.0	20.9	Yes	64.7	99.4	-34.6	-54%
BETWEEN MD-117 ON AND OFF RAMPS	1463	0.3	38.0	30.7	Yes	26.3	32.4	-6.2	-23%
FROM MD-117 TO I-370 INTERCHANGE	3727	0.7	43.4	34.3	Yes	58.6	74.0	-15.4	-26%
BETWEEN I-370 ON AND OFF RAMPS	3154	0.6	37.1	38.4	Yes	57.9	56.0	1.9	3%
FROM I-370 ON RAMP TO SHADY GROVE RD	4729	0.9	19.3	23.1	Yes	167.4	139.5	28.0	17%
BETWEEN SHADY GROVE RD ON AND OFF RAMPS	77	0.0	19.4	28.3	Yes	2.7	1.8	0.8	31%
FROM SHADY GROVE RD ON RAMP TO MD-28	9889	1.9	17.6	46.7	No	383.5	144.3	239.1	62%
BETWEEN MD-28 ON AND OFF RAMPS	52	0.0	25.0	42.4	No	1.4	0.8	0.6	41%
FROM MD-28 ON RAMP TO MD-189	4132	0.8	25.6	35.9	Yes	110.2	78.4	31.8	29%
BETWEEN MD-189 ON AND OFF RAMPS	3083	0.6	22.0	29.2	Yes	95.8	72.1	23.7	25%
FROM MD-189 ON RAMP TO MONTROSE RD	3383	0.6	19.8	25.3	Yes	116.4	91.2	25.2	22%
BETWEEN MONTROSE RD ON AND OFF RAMPS	4822	0.9	26.8	26.0	Yes	122.8	126.3	-3.5	-3%
FROM MONTROSE RD ON RAMP TO I-270 SPUR	6153	1.2	39.4	31.7	Yes	106.5	132.5	-26.0	-24%
FROM I-270 SPUR MD-187	1248	0.2	55.2	57.6	Yes	15.4	14.8	0.6	4%
BETWEEN MD-187 SPUR ON AND OFF RAMPS	4256	0.8	59.0	62.8	Yes	49.2	46.2	2.9	6%
FROM MD-187 ON RAMP TO I-495 INTERCHANGE	6196	1.2	54.1	61.8	Yes	78.1	68.4	9.8	13%
BETWEEN I-495 INTERCHANGE ON AND OFF RAMPS	1395	0.3	47.6	62.8	Yes	20.0	15.1	4.8	24%
I-270 SPUR MERGE	1150	0.2	23.3	24.0	Yes	33.7	32.7	1.0	3%
BETWEEN US-1 AND I-270 SPUR MERGE	2883	0.5	26.4	24.9	Yes	74.4	78.9	-4.5	-6%
MERGE US-1	2749	0.5	27.4	27.8	Yes	68.4	67.4	1.0	1%
MERGE I-495	4180	0.8	25.2	37.6	Yes	113.0	75.7	37.3	33%

Figure A.16: I-270 Northbound 8-9 AM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	8-9 AM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 NB	177527	33.6				1872.8	1932.7	-59.9	-3%
BETWEEN MD-355 AND GROSVENOR LANE	**1044**	**0.2**	51.5	60.4	No	13.8	11.8	**2.0**	**15%**
FROM GROSVENOR LANE TO EXIT 1A	**6217**	**1.2**	57.7	61.9	Yes	73.4	68.5	**4.9**	**7%**
BETWEEN EXIT 1A AND 1B	**4042**	**0.8**	61.0	63.4	Yes	45.2	43.5	**1.7**	**4%**
FROM MD-187 TO I-270 SPUR	**341**	**0.1**	60.5	61.9	Yes	3.8	3.8	**0.1**	**2%**
FROM TUCKERMAN LANE TO I-270 LOCAL	**7876**	**1.3**	61.5	62.2	Yes	78.4	77.5	**0.9**	**1%**
FROM I-270 LOCAL TO EXIT 5 FOR I-270 LOCAL	**5080**	**1.0**	65.4	62.5	Yes	52.9	55.4	**-2.5**	**-5%**
FROM EXIT 5 FOR I-270 LOCAL TO JUST SOUTH OF MD-189	**3227**	**0.6**	65.0	62.9	Yes	33.9	35.0	**-1.1**	**-3%**
BETWEEN MD-189 ON AND OFF RAMPS	**3080**	**0.6**	65.2	63.1	Yes	32.2	33.3	**-1.1**	**-3%**
FROM MD-189 TO JUST SOUTH OF MD-28	**4076**	**0.8**	65.4	62.8	Yes	42.5	44.3	**-1.8**	**-4%**
BETWEEN MD-28 ON AND OFF RAMPS	**49**	**0.0**	65.4	61.3	Yes	0.5	0.5	**0.0**	**-7%**
FROM MD-28 ON RAMP TO REDLAND BLVD	**10016**	**1.9**	64.0	63.8	Yes	106.8	107.0	**-0.2**	**0%**
BETWEEN SHADY GROVE RD ON AND OFF RAMPS	**74**	**0.0**	66.4	63.3	Yes	0.8	0.8	**0.0**	**-5%**
FROM SHADY GROVE RD ON RAMP TO I-370 INTERCHANGE	**4827**	**0.9**	66.9	63.6	Yes	49.2	51.7	**-2.5**	**-5%**
FROM I-370 INTERCHANGE TO MUDDY BRANCH RD	**172**	**0.0**	67.2	63.7	Yes	1.7	1.8	**-0.1**	**-5%**
FROM MUDDY BRANCH RD TO JUST SOUTH OF MD-117 INTERCHANGE	**7943**	**1.5**	66.2	62.8	Yes	81.8	86.2	**-4.4**	**-5%**
FROM JUST SOUTH OF MD-117 INTERCHANGE TO MD-117	**29**	**0.0**	66.3	62.9	Yes	0.3	0.3	**0.0**	**-5%**
FROM MD-117 TO MD-124 OFF RAMP	**3249**	**0.6**	66.7	63.1	Yes	33.2	35.1	**-1.9**	**-6%**
BETWEEN MD-124 ON AND OFF RAMPS	**27**	**0.0**	66.8	63.9	Yes	0.3	0.3	**0.0**	**-4%**
FROM MD-124 ON RAMP TO JUST SOUTH OF MIDDLEBROOK RD	**12046**	**2.3**	66.0	63.3	Yes	124.5	129.8	**-5.3**	**-4%**
BETWEEN MIDDLEBROOK RD ON AND OFF RAMPS	**1221**	**0.2**	63.9	63.6	Yes	13.0	13.1	**-0.1**	**-1%**
FROM MIDDLEBROOK RD ON RAMP TO MD-118 OFF RAMP	**2423**	**0.5**	63.3	63.3	Yes	26.1	26.1	**0.0**	**0%**
BETWEEN MD-118 ON AND OFF RAMPS	**3423**	**0.6**	63.6	63.2	Yes	36.7	36.9	**-0.2**	**-1%**
FROM MD-118 ON RAMP TO MD-27	**1487**	**0.3**	63.8	63.2	Yes	15.9	16.0	**-0.1**	**-1%**
BETWEEN MD-27 ON AND OFF RAMPS	**3356**	**0.6**	65.5	63.5	Yes	34.9	36.0	**-1.1**	**-3%**
FROM MD-27 ON RAMP TO MD-121 OFF RAMP	**11527**	**2.2**	65.1	63.5	Yes	120.8	123.8	**-3.0**	**-2%**
BETWEEN MD-121 ON AND OFF RAMPS	**959**	**0.2**	64.6	62.9	Yes	10.1	10.4	**-0.3**	**-3%**
FROM MD-121 TO MD-109	**20431**	**3.9**	66.5	63.2	Yes	209.4	220.6	**-11.1**	**-5%**
BETWEEN MD-109 ON AND OFF RAMPS	**920**	**0.2**	65.0	64.5	Yes	9.7	9.7	**-0.1**	**-1%**
FROM MD-109 ON RAMP TO MD-80	**18686**	**3.5**	66.1	62.4	Yes	192.7	204.3	**-11.5**	**-6%**
BETWEEN MD-80 ON AND OFF RAMPS	**946**	**0.2**	65.7	60.7	Yes	9.8	10.6	**-0.8**	**-8%**
FROM MD-80 ON RAMP TO MD-85	**24888**	**4.7**	66.3	62.7	Yes	255.9	270.6	**-14.7**	**-6%**
BETWEEN MD-85 ON AND OFF RAMPS	**2482**	**0.5**	61.7	63.1	Yes	27.4	26.8	**0.6**	**2%**
MERGE FROM I 495	**4953**	**0.9**	60.6	53.4	No	55.7	63.3	**-7.5**	**-13%**
MERGE US-1	**2620**	**0.5**	61.9	62.9	Yes	28.9	28.4	**0.5**	**2%**
BETWEEN I-270 SPUR MERGE AND US 1	**2977**	**0.6**	61.8	63.3	Yes	32.9	32.1	**0.8**	**2%**
MERGE I-270 SPUR	**1612**	**0.3**	62.5	63.0	Yes	17.6	17.4	**0.1**	**1%**

Figure A.17: I-495 Inner Loop 4-5 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	4-5 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Inner Loop	**228612**	**43.3**				**5846.4**	**5433.0**	**413.5**	**7%**
VA-193/GEORGETOWN PIKE/EXIT 13	2729	0.5	8.2	18.2	Yes	227.9	102.2	125.7	55%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	2453	0.5	8.9	9.6	Yes	187.8	174.3	13.5	7%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	1935	0.4	12.2	12.5	Yes	108.4	105.9	2.4	2%
AMERICAN LEGION BRIDGE	794	0.2	14.4	17.1	Yes	37.6	31.7	6.0	16%
BEFORE AMERICAN LEGION BRIDGE	508	0.1	14.5	16.4	Yes	23.8	21.1	2.7	12%
MERGE CLARA BARTON PARKWAY	1055	0.2	14.7	16.0	Yes	49.1	45.1	4.0	8%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7287	1.4	13.8	15.1	Yes	360.9	329.4	31.5	9%
MERGE CABIN JOHN PARKWAY	2126	0.4	11.9	13.2	Yes	122.1	109.7	12.4	10%
BETWEEN CABIN JOHN PARKWAY AND MD 190	259	0.0	13.4	14.9	Yes	13.1	11.8	1.3	10%
MERGE MD 190	1235	0.2	13.5	14.4	Yes	62.4	58.6	3.9	6%
BETWEEN MD 190 AND I 270	6468	1.2	18.6	23.5	Yes	236.6	187.8	48.8	21%
MERGE I 270	867	0.2	51.3	55.0	Yes	11.5	10.7	0.8	7%
BETWEEN I 270 AND MD 187	7828	1.5	60.9	49.1	Yes	87.7	108.6	-20.9	-24%
MERGE MD 187	2140	0.4	47.4	13.7	No	30.8	106.8	-76.0	-247%
BETWEEN MD 187 AND I 270	2278	0.4	20.7	12.1	Yes	74.9	128.7	-53.8	-72%
MERGE BEFORE I 270	1306	0.2	10.9	15.4	Yes	81.7	57.8	23.9	29%
MERGE AFTER I 270	564	0.1	14.0	14.6	Yes	27.5	26.4	1.1	4%
MD 355 MERGE	1371	0.3	13.8	12.7	Yes	68.0	73.6	-5.7	-8%
BETWEEN MD 355 AND MD 185	6065	1.1	14.0	16.0	Yes	294.6	257.8	36.8	12%
MD 185 MERGE	2074	0.4	14.1	14.5	Yes	100.1	97.4	2.6	3%
BETWEEN MD 185 AND MD 97	9907	1.9	21.6	24.8	Yes	312.4	272.5	39.9	13%
MD 97 MERGE	1461	0.3	23.9	21.5	Yes	41.6	46.4	-4.8	-11%
BETWEEN MD 97 AND US 29	5965	1.1	29.2	35.9	Yes	139.3	113.2	26.0	19%
MERGE US 29	1734	0.3	30.1	29.4	Yes	39.3	40.2	-0.9	-2%
BETWEEN MD US 29 AND MD 193	1640	0.3	26.2	18.2	Yes	42.7	61.4	-18.8	-44%
MERGE MD 193	2099	0.4	26.3	20.2	Yes	54.4	70.8	-16.4	-30%
BETWEEN MD 193 AND MD 650	6046	1.1	37.1	32.8	Yes	111.1	125.7	-14.6	-13%
MERGE MD 650	3008	0.6	42.4	39.8	Yes	48.3	51.5	-3.2	-7%
BETWEEN MD 650 AND I 95	2869	0.5	41.1	51.3	Yes	47.5	38.2	9.4	20%
BEFORE I 95 MERGE	5612	1.1	36.3	30.1	Yes	105.6	127.2	-21.6	-20%
AFTER I 95 MERGE	2578	0.5	14.9	19.5	Yes	117.8	90.0	27.8	24%
MERGE US 1	2873	0.5	15.3	15.9	Yes	128.2	123.4	4.8	4%
BEFORE GREENBELT STATION MERGE	3544	0.7	18.5	33.0	Yes	130.8	73.1	57.6	44%
AFTER GREENBELT STATION MERGE	595	0.1	22.4	47.4	No	18.1	8.6	9.5	53%
BETWEEN GREENBELT STATION AND MD 201	4415	0.8	22.8	47.8	No	131.9	62.9	69.0	52%
MERGE MD 201	3066	0.6	21.2	34.4	Yes	98.6	60.8	37.8	38%
BETWEEN MD 201 AND MD 295 MERGE	1900	0.4	25.5	34.1	Yes	50.8	38.0	12.7	25%
MERGE MD 295	2725	0.5	26.4	42.7	No	70.4	43.6	26.8	38%
BETWEEN MD 295 AND MD 450	10677	2.0	27.9	33.8	Yes	260.6	215.4	45.1	17%
MERGE MD 450	1203	0.2	27.1	23.3	Yes	30.3	35.2	-4.9	-16%
BETWEEN MD 450 AND US 50	2809	0.5	32.9	23.7	Yes	58.2	80.7	-22.4	-38%
MERGE US 50	4270	0.8	24.7	12.9	Yes	117.7	225.8	-108.1	-92%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	5460	1.0	27.3	23.5	Yes	136.3	158.7	-22.4	-16%
END 495 EXPRESS LANE	515	0.1	24.2	25.4	Yes	14.5	13.8	0.7	5%
BEFORE MD 202 MERGE	1817	0.3	25.0	20.4	Yes	49.6	60.7	-11.1	-22%
MERGE MD 202	2462	0.5	21.3	20.4	Yes	78.9	82.4	-3.5	-4%
BETWEEN MD 202 AND ARENA DR	1355	0.3	18.5	20.0	Yes	49.9	46.1	3.8	8%
MERGE ARENA DR	2059	0.4	19.1	24.8	Yes	73.6	56.6	17.0	23%
BETWEEN ARENA DR AND MD 214	3333	0.6	21.8	45.3	No	104.3	50.1	54.2	52%
MD 214 MERGE	2564	0.5	22.9	42.9	No	76.3	40.8	35.5	47%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	5923	1.1							
MERGE RITCHIE MARLBORO RD	3041	0.6							
BETWEEN RITCHIE MARLBORO AND MD 4	9698	1.8	42.9	51.1	Yes	154.0	129.5	24.5	16%
MERGE MD 4	2628	0.5	53.7	51.7	Yes	33.3	34.7	-1.3	-4%
BETWEEN MD 4 AND FORESTVILLE RD	3339	0.6	53.4	51.5	Yes	42.6	44.2	-1.6	-4%
MERGE FORESTVILLE RD	930	0.2	54.2	52.5	Yes	11.7	12.1	-0.4	-3%
BETWEEN FORESTVILLE AND MD 218	3213	0.6	54.8	61.7	Yes	40.0	35.5	4.5	11%
MERGE MD 218	1660	0.3	55.0	63.0	Yes	20.6	18.0	2.6	13%
BETWEEN MD 218 AND MD 5	6410	1.2	59.8	59.6	Yes	73.1	73.3	-0.2	0%
MERGE MD 5	2751	0.5	63.0	62.7	Yes	29.8	29.9	-0.1	0%
BETWEEN MD 5 AND MD 414	11958	2.3	64.4	62.9	Yes	126.6	129.5	-2.9	-2%
MERGE MD 414	3478	0.7	63.6	63.2	Yes	37.3	37.5	-0.3	-1%
BETWEEN MD 414 AND MD 210	2470	0.5	61.4	60.4	Yes	27.4	27.9	-0.4	-2%
MERGE MD 210	5648	1.1	48.9	60.9	Yes	78.7	63.2	15.5	20%
BETWEEN MD 210 AND I 295	2959	0.6	34.5	36.5	Yes	58.4	55.3	3.1	5%
MERGE I 295	3328	0.6	34.5	26.2	Yes	65.7	86.5	-20.8	-32%
BEFORE WOODROW WILSON BRIDGE	1217	0.2	44.7	46.8	Yes	18.6	17.7	0.8	5%
WOODROW WILSON BRIDGE	6059	1.1	49.7	52.5	Yes	83.2	78.6	4.6	5%

Figure A.18: I-495 Outer Loop 4-5 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	4-5 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Outer Loop	**230042**	**43.6**				**4639.4**	**4785.1**	**-145.8**	**-3%**
WOODROW WILSON BRIDGE	6160	1.2	48.4	55.4	Yes	86.8	75.8	11.0	13%
BEFORE WOODROW WILSON BRIDGE	644	0.1	52.6	59.7	Yes	8.3	7.4	1.0	12%
MERGE I 295	1023	0.2	57.7	58.8	Yes	12.1	11.9	0.2	2%
BETWEEN MD 210 AND I 295	377	0.1	54.6	60.3	Yes	4.7	4.3	0.4	9%
MERGE MD 210	8656	1.6	53.5	57.9	Yes	110.4	102.0	8.4	8%
BETWEEN MD 414 AND MD 210	4452	0.8	53.4	55.9	Yes	56.8	54.3	2.5	4%
MERGE MD 414	2984	0.6	45.3	57.8	Yes	44.9	35.2	9.8	22%
BETWEEN MD 5 AND MD 414	12214	2.3	30.9	52.5	No	269.6	158.6	110.9	41%
MERGE MD 5	3740	0.7	21.0	53.1	No	121.7	48.1	73.6	61%
BETWEEN MD 218 AND MD 5	5897	1.1	21.5	44.7	No	186.6	89.9	96.7	52%
MERGE MD 218	238	0.0	21.2	30.1	Yes	7.7	5.4	2.3	30%
BETWEEN FORESTVILLE AND MD 218	4910	0.9	19.5	21.1	Yes	171.7	158.9	12.8	7%
MERGE MD 337	912	0.2	19.6	19.1	Yes	31.8	32.5	-0.8	-2%
BETWEEN MD 4 AND FORESTVILLE RD	3145	0.6	24.9	37.1	Yes	86.3	57.8	28.4	33%
MERGE MD 4	3108	0.6	26.9	52.6	No	78.7	40.3	38.4	49%
BETWEEN RITCHIE MARLBORO AND MD 4	9857	1.9							
MERGE RITCHIE MARLBORO RD	2341	0.4							
BETWEEN MD 214 AND RITCHIE MARLBORO RD	6303	1.2	39.6	22.3	Yes	108.5	192.9	-84.4	-78%
MERGE MD 214	2618	0.5	41.0	11.9	No	43.6	149.7	-106.1	-244%
BETWEEN ARENA DR AND MD 214	2789	0.5	36.6	14.1	No	51.9	135.2	-83.3	-160%
MERGE ARENA DR	2437	0.5	31.1	13.8	Yes	53.4	120.5	-67.1	-126%
BETWEEN MD 202 AND ARENA DR	1179	0.2	24.1	12.8	Yes	33.4	62.9	-29.5	-88%
MERGE MD 202	3055	0.6	21.2	13.1	Yes	98.4	159.4	-61.1	-62%
BEFORE MD 202 MERGE	908	0.2	21.8	10.1	Yes	28.3	61.4	-33.1	-117%
END 495 EXPRESS LANE	594	0.1	19.4	15.5	Yes	20.9	26.2	-5.3	-26%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	6101	1.2	31.2	30.7	Yes	133.5	135.3	-1.9	-1%
MERGE US 50	3680	0.7	50.7	58.6	Yes	49.5	42.8	6.7	14%
BETWEEN MD 450 AND US 50	2561	0.5	41.3	53.2	Yes	42.3	32.8	9.4	22%
MERGE MD 450	2100	0.4	40.0	44.8	Yes	35.8	32.0	3.8	11%
BETWEEN MD 295 AND MD 450	10674	2.0	40.2	26.3	Yes	181.1	277.2	-96.1	-53%
MERGE MD 295	2479	0.5	32.0	13.1	Yes	52.8	128.8	-76.0	-144%
BETWEEN MD 201 AND MD 295 MERGE	1996	0.4	31.3	14.0	Yes	43.5	97.5	-53.9	-124%
MERGE MD 201	3054	0.6	33.6	17.0	Yes	62.0	122.3	-60.3	-97%
BETWEEN GREENBELT STATION AND MD 201	4643	0.9	42.5	23.5	No	74.4	134.6	-60.2	-81%
BETWEEN GREENBELT STATION AND US 1	4102	0.8	56.1	31.6	No	49.8	88.4	-38.6	-77%
MERGE US 1	2739	0.5	57.4	57.2	Yes	32.5	32.7	-0.1	0%
BETWEEN US 1 AND I 95	3225	0.6	58.0	57.2	Yes	37.9	38.4	-0.5	-1%
I 95 MERGE	4389	0.8	63.1	58.6	Yes	47.4	51.1	-3.7	-8%
BETWEEN MD 650 AND I 95	4048	0.8	51.1	53.3	Yes	54.0	51.8	2.2	4%
MERGE MD 650	2547	0.5	41.7	53.5	Yes	41.7	32.5	9.2	22%
BETWEEN MD 193 AND MD 650	6315	1.2	31.6	52.0	No	136.4	82.7	53.7	39%
MERGE MD 193	1353	0.3	34.6	54.0	No	26.7	17.1	9.6	36%
BETWEEN MD US 29 AND MD 193	2722	0.5	31.3	52.6	No	59.2	35.3	24.0	40%
MERGE US 29	1127	0.2	28.9	51.4	No	26.6	15.0	11.6	44%
BETWEEN MD 97 AND US 29	5926	1.1	29.8	51.2	No	135.5	78.9	56.7	42%
MD 97 MERGE	1734	0.3	33.0	53.1	No	35.9	22.3	13.6	38%
BETWEEN MD 185 AND MD 97	8746	1.7	39.6	50.4	Yes	150.6	118.3	32.3	21%
MD 185 MERGE	3315	0.6	47.8	46.1	Yes	47.3	49.0	-1.7	-4%
BETWEEN MD 355 AND MD 185	6287	1.2	48.1	47.1	Yes	89.1	90.9	-1.8	-2%
MD 355 MERGE	1401	0.3	45.9	53.2	Yes	20.8	17.9	2.9	14%
MERGE AFTER I 270	61	0.0	45.2	54.1	Yes	0.9	0.8	0.2	16%
MERGE BEFORE I 270	1298	0.2	44.2	49.4	Yes	20.0	17.9	2.1	10%
BETWEEN I 270 EAST AND MD 187	3092	0.6	40.8	53.3	Yes	51.6	39.6	12.1	23%
MERGE MD 187	1936	0.4	30.4	52.6	No	43.5	25.1	18.4	42%
BETWEEN I 270 WEST AND MD 187	7643	1.4	21.1	43.1	No	246.5	121.0	125.5	51%
MERGE I 270	1490	0.3	16.5	20.3	Yes	61.7	50.1	11.6	19%
BETWEEN MD 190 AND I 270	5753	1.1	17.3	19.2	Yes	226.5	204.1	22.4	10%
MERGE MD 190	1537	0.3	17.8	14.9	Yes	58.9	70.2	-11.3	-19%
BETWEEN CABIN JOHN PARKWAY AND MD 190	214	0.0	17.8	13.2	Yes	8.2	11.0	-2.8	-34%
MERGE CABIN JOHN PARKWAY	2397	0.5	17.7	14.4	Yes	92.6	113.8	-21.2	-23%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	6336	1.2	23.8	22.2	Yes	181.6	194.2	-12.6	-7%
MERGE CLARA BARTON PARKWAY	1463	0.3	27.3	37.4	Yes	36.6	26.6	9.9	27%
BEFORE AMERICAN LEGION BRIDGE	746	0.1	33.1	44.3	Yes	15.3	11.5	3.9	25%
AMERICAN LEGION BRIDGE	790	0.1	28.5	35.9	Yes	18.9	15.0	3.9	21%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	843	0.2	32.3	27.6	Yes	17.8	20.8	-3.0	-17%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	4288	0.8	25.3	21.3	Yes	115.5	137.1	-21.6	-19%
VA-193/GEORGETOWN PIKE/EXIT 13 (2)	679	0.1	22.9	13.7	Yes	20.2	33.9	-13.7	-67%
VA-193/GEORGETOWN PIKE/EXIT 13 (1)	1669	0.3	28.4	14.9	Yes	40.1	76.2	-36.1	-90%

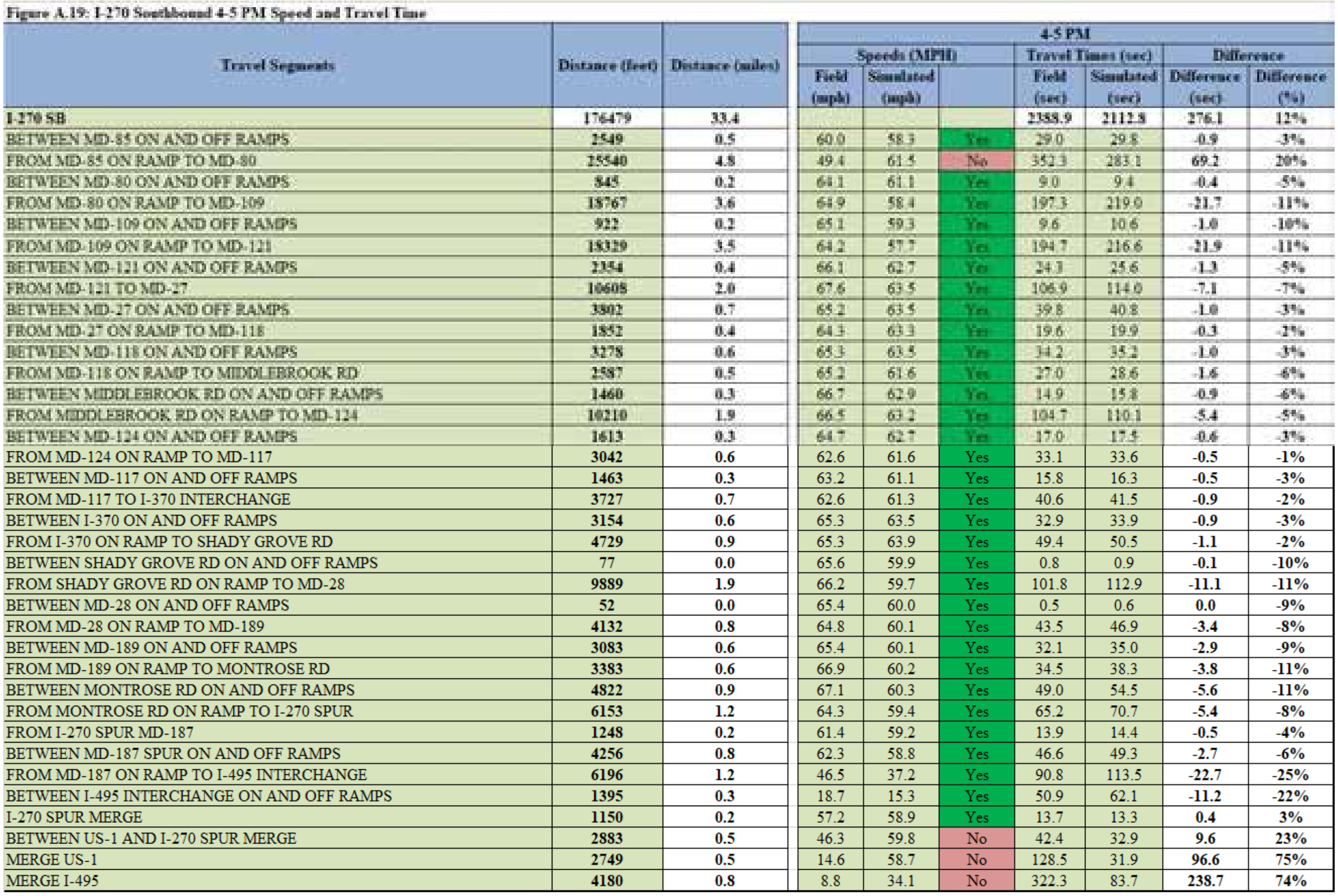
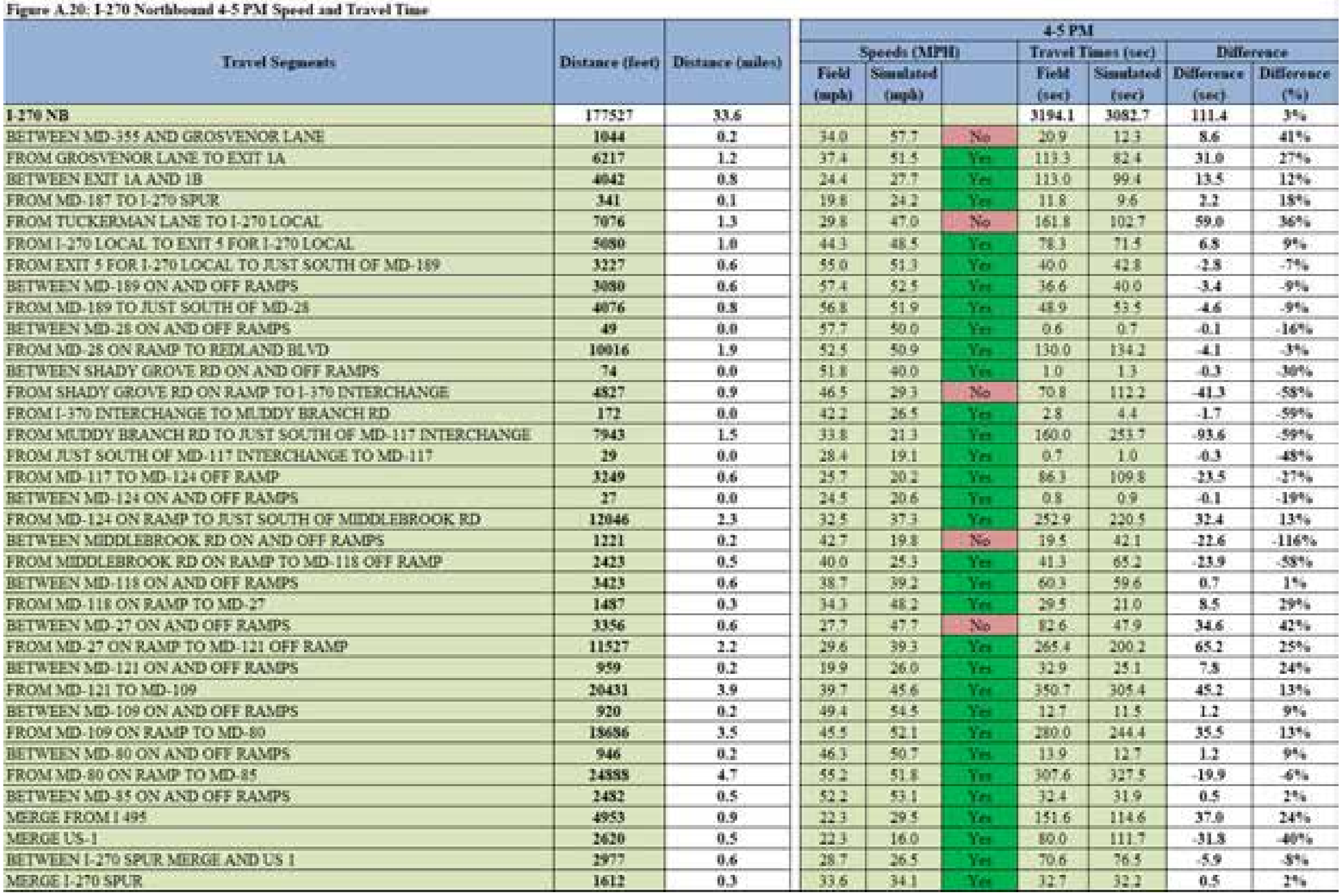


Figure A.19: I-270 Southbound 4-5 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	4-5 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)		Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 SB	176479	33.4				2388.9	2112.8	276.1	12%
BETWEEN MD-85 ON AND OFF RAMPS	2549	0.5	60.0	58.3	Yes	29.0	29.8	-0.9	-3%
FROM MD-85 ON RAMP TO MD-80	25540	4.8	49.4	61.5	No	352.3	283.1	69.2	20%
BETWEEN MD-80 ON AND OFF RAMPS	845	0.2	64.1	61.1	Yes	9.0	9.4	-0.4	-5%
FROM MD-80 ON RAMP TO MD-109	18767	3.6	64.9	58.4	Yes	197.3	219.0	-21.7	-11%
BETWEEN MD-109 ON AND OFF RAMPS	922	0.2	65.1	59.3	Yes	9.6	10.6	-1.0	-10%
FROM MD-109 ON RAMP TO MD-121	18329	3.5	64.2	57.7	Yes	194.7	216.6	-21.9	-11%
BETWEEN MD-121 ON AND OFF RAMPS	2354	0.4	66.1	62.7	Yes	24.3	25.6	-1.3	-5%
FROM MD-121 TO MD-27	10608	2.0	67.6	63.5	Yes	106.9	114.0	-7.1	-7%
BETWEEN MD-27 ON AND OFF RAMPS	3802	0.7	65.2	63.5	Yes	39.8	40.8	-1.0	-3%
FROM MD-27 ON RAMP TO MD-118	1852	0.4	64.3	63.3	Yes	19.6	19.9	-0.3	-2%
BETWEEN MD-118 ON AND OFF RAMPS	3278	0.6	65.3	63.5	Yes	34.2	35.2	-1.0	-3%
FROM MD-118 ON RAMP TO MIDDLEBROOK RD	2587	0.5	65.2	61.6	Yes	27.0	28.6	-1.6	-6%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMPS	1460	0.3	66.7	62.9	Yes	14.9	15.8	-0.9	-6%
FROM MIDDLEBROOK RD ON RAMP TO MD-124	10210	1.9	66.5	63.2	Yes	104.7	110.1	-5.4	-5%
BETWEEN MD-124 ON AND OFF RAMPS	1613	0.3	64.7	62.7	Yes	17.0	17.5	-0.6	-3%
FROM MD-124 ON RAMP TO MD-117	3042	0.6	62.6	61.6	Yes	33.1	33.6	-0.5	-1%
BETWEEN MD-117 ON AND OFF RAMPS	1463	0.3	63.2	61.1	Yes	15.8	16.3	-0.5	-3%
FROM MD-117 TO I-370 INTERCHANGE	3727	0.7	62.6	61.3	Yes	40.6	41.5	-0.9	-2%
BETWEEN I-370 ON AND OFF RAMPS	3154	0.6	65.3	63.5	Yes	32.9	33.9	-0.9	-3%
FROM I-370 ON RAMP TO SHADY GROVE RD	4729	0.9	65.3	63.9	Yes	49.4	50.5	-1.1	-2%
BETWEEN SHADY GROVE RD ON AND OFF RAMPS	77	0.0	65.6	59.9	Yes	0.8	0.9	-0.1	-10%
FROM SHADY GROVE RD ON RAMP TO MD-28	9889	1.9	66.2	59.7	Yes	101.8	112.9	-11.1	-11%
BETWEEN MD-28 ON AND OFF RAMPS	52	0.0	65.4	60.0	Yes	0.5	0.6	0.0	-9%
FROM MD-28 ON RAMP TO MD-189	4132	0.8	64.8	60.1	Yes	43.5	46.9	-3.4	-8%
BETWEEN MD-189 ON AND OFF RAMPS	3083	0.6	65.4	60.1	Yes	32.1	35.0	-2.9	-9%
FROM MD-189 ON RAMP TO MONTROSE RD	3383	0.6	66.9	60.2	Yes	34.5	38.3	-3.8	-11%
BETWEEN MONTROSE RD ON AND OFF RAMPS	4822	0.9	67.1	60.3	Yes	49.0	54.5	-5.6	-11%
FROM MONTROSE RD ON RAMP TO I-270 SPUR	6153	1.2	64.3	59.4	Yes	65.2	70.7	-5.4	-8%
FROM I-270 SPUR MD-187	1248	0.2	61.4	59.2	Yes	13.9	14.4	-0.5	-4%
BETWEEN MD-187 SPUR ON AND OFF RAMPS	4256	0.8	62.3	58.8	Yes	46.6	49.3	-2.7	-6%
FROM MD-187 ON RAMP TO I-495 INTERCHANGE	6196	1.2	46.5	37.2	Yes	90.8	113.5	-22.7	-25%
BETWEEN I-495 INTERCHANGE ON AND OFF RAMPS	1395	0.3	18.7	15.3	Yes	50.9	62.1	-11.2	-22%
I-270 SPUR MERGE	1150	0.2	57.2	58.9	Yes	13.7	13.3	0.4	3%
BETWEEN US-1 AND I-270 SPUR MERGE	2883	0.5	46.3	59.8	No	42.4	32.9	9.6	23%
MERGE US-1	2749	0.5	14.6	58.7	No	128.5	31.9	96.6	75%
MERGE I-495	4180	0.8	8.8	34.1	No	322.3	83.7	238.7	74%

Figure A.20: I-270 Northbound 4-5 PM Speed and Travel Time



Travel Segments	Distance (feet)	Distance (miles)	4-5 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)		Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 NB	177527	33.6				**3194.1**	**3082.7**	**111.4**	**3%**
BETWEEN MD-355 AND GROSVENOR LANE	**1044**	**0.2**	34.0	57.7	🟥 No	20.9	12.3	**8.6**	**41%**
FROM GROSVENOR LANE TO EXIT 1A	**6217**	**1.2**	37.4	51.5	🟩 Yes	113.3	82.4	**31.0**	**27%**
BETWEEN EXIT 1A AND 1B	**4042**	**0.8**	24.4	27.7	🟩 Yes	113.0	99.4	**13.5**	**12%**
FROM MD-187 TO I-270 SPUR	**341**	**0.1**	19.8	24.2	🟩 Yes	11.8	9.6	**2.2**	**18%**
FROM TUCKERMAN LANE TO I-270 LOCAL	**7076**	**1.3**	29.8	47.0	🟥 No	161.8	102.7	**59.0**	**36%**
FROM I-270 LOCAL TO EXIT 5 FOR I-270 LOCAL	**5080**	**1.0**	44.3	48.5	🟩 Yes	78.3	71.5	**6.8**	**9%**
FROM EXIT 5 FOR I-270 LOCAL TO JUST SOUTH OF MD-189	**3227**	**0.6**	55.0	51.3	🟩 Yes	40.0	42.8	**-2.8**	**-7%**
BETWEEN MD-189 ON AND OFF RAMPS	**3080**	**0.6**	57.4	52.5	🟩 Yes	36.6	40.0	**-3.4**	**-9%**
FROM MD-189 TO JUST SOUTH OF MD-28	**4076**	**0.8**	56.8	51.9	🟩 Yes	48.9	53.5	**-4.6**	**-9%**
BETWEEN MD-28 ON AND OFF RAMPS	**49**	**0.0**	57.7	50.0	🟩 Yes	0.6	0.7	**-0.1**	**-16%**
FROM MD-28 ON RAMP TO REDLAND BLVD	**10016**	**1.9**	52.5	50.9	🟩 Yes	130.0	134.2	**-4.1**	**-3%**
BETWEEN SHADY GROVE RD ON AND OFF RAMPS	**74**	**0.0**	51.8	40.0	🟩 Yes	1.0	1.3	**-0.3**	**-30%**
FROM SHADY GROVE RD ON RAMP TO I-370 INTERCHANGE	**4827**	**0.9**	46.5	29.3	🟥 No	70.8	112.2	**-41.3**	**-58%**
FROM I-370 INTERCHANGE TO MUDDY BRANCH RD	**172**	**0.0**	42.2	26.5	🟩 Yes	2.8	4.4	**-1.7**	**-59%**
FROM MUDDY BRANCH RD TO JUST SOUTH OF MD-117 INTERCHANGE	**7943**	**1.5**	33.8	21.3	🟩 Yes	160.0	253.7	**-93.6**	**-59%**
FROM JUST SOUTH OF MD-117 INTERCHANGE TO MD-117	**29**	**0.0**	28.4	19.1	🟩 Yes	0.7	1.0	**-0.3**	**-48%**
FROM MD-117 TO MD-124 OFF RAMP	**3249**	**0.6**	25.7	20.2	🟩 Yes	86.3	109.8	**-23.5**	**-27%**
BETWEEN MD-124 ON AND OFF RAMPS	**27**	**0.0**	24.5	20.6	🟩 Yes	0.8	0.9	**-0.1**	**-19%**
FROM MD-124 ON RAMP TO JUST SOUTH OF MIDDLEBROOK RD	**12046**	**2.3**	32.5	37.3	🟩 Yes	252.9	220.5	**32.4**	**13%**
BETWEEN MIDDLEBROOK RD ON AND OFF RAMPS	**1221**	**0.2**	42.7	19.8	🟥 No	19.5	42.1	**-22.6**	**-116%**
FROM MIDDLEBROOK RD ON RAMP TO MD-118 OFF RAMP	**2423**	**0.5**	40.0	25.3	🟩 Yes	41.3	65.2	**-23.9**	**-58%**
BETWEEN MD-118 ON AND OFF RAMPS	**3423**	**0.6**	38.7	39.2	🟩 Yes	60.3	59.6	**0.7**	**1%**
FROM MD-118 ON RAMP TO MD-27	**1487**	**0.3**	34.3	48.2	🟩 Yes	29.5	21.0	**8.5**	**29%**
BETWEEN MD-27 ON AND OFF RAMPS	**3356**	**0.6**	27.7	47.7	🟥 No	82.6	47.9	**34.6**	**42%**
FROM MD-27 ON RAMP TO MD-121 OFF RAMP	**11527**	**2.2**	29.6	39.3	🟩 Yes	265.4	200.2	**65.2**	**25%**
BETWEEN MD-121 ON AND OFF RAMPS	**959**	**0.2**	19.9	26.0	🟩 Yes	32.9	25.1	**7.8**	**24%**
FROM MD-121 TO MD-109	**20431**	**3.9**	39.7	45.6	🟩 Yes	350.7	305.4	**45.2**	**13%**
BETWEEN MD-109 ON AND OFF RAMPS	**920**	**0.2**	49.4	54.5	🟩 Yes	12.7	11.5	**1.2**	**9%**
FROM MD-109 ON RAMP TO MD-80	**18686**	**3.5**	45.5	52.1	🟩 Yes	280.0	244.4	**35.5**	**13%**
BETWEEN MD-80 ON AND OFF RAMPS	**946**	**0.2**	46.3	50.7	🟩 Yes	13.9	12.7	**1.2**	**9%**
FROM MD-80 ON RAMP TO MD-85	**24888**	**4.7**	55.2	51.8	🟩 Yes	307.6	327.5	**-19.9**	**-6%**
BETWEEN MD-85 ON AND OFF RAMPS	**2482**	**0.5**	52.2	53.1	🟩 Yes	32.4	31.9	**0.5**	**2%**
MERGE FROM I 495	**4953**	**0.9**	22.3	29.5	🟩 Yes	151.6	114.6	**37.0**	**24%**
MERGE US-1	**2620**	**0.5**	22.3	16.0	🟩 Yes	80.0	111.7	**-31.8**	**-40%**
BETWEEN I-270 SPUR MERGE AND US 1	**2977**	**0.6**	28.7	26.5	🟩 Yes	70.6	76.5	**-5.9**	**-8%**
MERGE I-270 SPUR	**1612**	**0.3**	33.6	34.1	🟩 Yes	32.7	32.2	**0.5**	**2%**

Figure A.21: I-495 Inner Loop 5-6 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	5-6 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Inner Loop	**228612**	**43.3**				**6551.1**	**6631.9**	**-80.7**	**-1%**
VA-193/GEORGETOWN PIKE/EXIT 13	2729	0.5	7.8	7.0	Yes	237.6	266.9	-29.3	-12%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	2453	0.5	8.8	6.9	Yes	190.7	243.0	-52.3	-27%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	1935	0.4	12.0	11.3	Yes	110.1	116.4	-6.3	-6%
AMERICAN LEGION BRIDGE	794	0.2	13.7	15.3	Yes	39.6	35.4	4.2	11%
BEFORE AMERICAN LEGION BRIDGE	508	0.1	13.8	14.2	Yes	25.0	24.3	0.7	3%
MERGE CLARA BARTON PARKWAY	1055	0.2	13.5	13.9	Yes	53.1	51.7	1.4	3%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7287	1.4	12.5	13.1	Yes	397.3	378.7	18.6	5%
MERGE CABIN JOHN PARKWAY	2126	0.4	10.5	11.8	Yes	137.8	122.5	15.3	11%
BETWEEN CABIN JOHN PARKWAY AND MD 190	259	0.0	11.5	13.3	Yes	15.4	13.2	2.1	14%
MERGE MD 190	1235	0.2	11.6	12.9	Yes	72.8	65.5	7.2	10%
BETWEEN MD 190 AND I 270	6468	1.2	16.4	20.1	Yes	268.2	219.7	48.5	18%
MERGE I 270	867	0.2	49.5	54.9	Yes	11.9	10.8	1.2	10%
BETWEEN I 270 AND MD 187	7828	1.5	58.8	20.3	No	90.8	262.5	-171.7	-189%
MERGE MD 187	2140	0.4	28.7	6.5	No	50.9	225.0	-174.1	-342%
BETWEEN MD 187 AND I 270	2278	0.4	10.9	9.0	Yes	142.5	173.5	-31.0	-22%
MERGE BEFORE I 270	1306	0.2	9.5	12.6	Yes	93.9	70.5	23.3	25%
MERGE AFTER I 270	564	0.1	10.4	13.2	Yes	37.2	29.2	8.0	21%
MD 355 MERGE	1371	0.3	10.4	11.5	Yes	89.9	81.1	8.8	10%
BETWEEN MD 355 AND MD 185	6065	1.1	12.6	15.2	Yes	327.8	271.7	56.0	17%
MD 185 MERGE	2074	0.4	13.3	13.3	Yes	106.5	106.2	0.3	0%
BETWEEN MD 185 AND MD 97	9907	1.9	21.4	22.8	Yes	316.0	296.4	19.5	6%
MD 97 MERGE	1461	0.3	24.1	19.2	Yes	41.3	51.8	-10.5	-25%
BETWEEN MD 97 AND US 29	5965	1.1	28.5	29.8	Yes	142.6	136.5	6.2	4%
MERGE US 29	1734	0.3	28.5	21.5	Yes	41.5	54.9	-13.4	-32%
BETWEEN MD US 29 AND MD 193	1640	0.3	23.4	16.5	Yes	47.8	67.6	-19.8	-41%
MERGE MD 193	2099	0.4	23.5	18.7	Yes	60.8	76.7	-15.9	-26%
BETWEEN MD 193 AND MD 650	6046	1.1	32.1	31.3	Yes	128.3	131.5	-3.3	-3%
MERGE MD 650	3008	0.6	33.8	37.3	Yes	60.7	55.0	5.7	9%
BETWEEN MD 650 AND I 95	2869	0.5	32.2	50.6	No	60.8	38.7	22.1	36%
BEFORE I 95 MERGE	5612	1.1	25.7	38.9	Yes	149.1	98.5	50.6	34%
AFTER I 95 MERGE	2578	0.5	12.6	19.0	Yes	139.9	92.6	47.3	34%
MERGE US 1	2873	0.5	13.7	14.9	Yes	142.7	131.6	11.1	8%
BEFORE GREENBELT STATION MERGE	3544	0.7	17.1	29.3	Yes	140.9	82.4	58.5	42%
AFTER GREENBELT STATION MERGE	595	0.1	21.0	36.3	Yes	19.3	11.2	8.1	42%
BETWEEN GREENBELT STATION AND MD 201	4415	0.8	21.5	32.7	Yes	140.0	92.0	48.0	34%
MERGE MD 201	3066	0.6	20.2	18.0	Yes	103.3	116.4	-13.2	-13%
BETWEEN MD 201 AND MD 295 MERGE	1900	0.4	25.6	26.8	Yes	50.6	48.2	2.3	5%
MERGE MD 295	2725	0.5	26.2	22.8	Yes	70.8	81.6	-10.8	-15%
BETWEEN MD 295 AND MD 450	10677	2.0	28.3	22.7	Yes	257.1	320.1	-63.0	-25%
MERGE MD 450	1203	0.2	27.2	19.4	Yes	30.2	42.4	-12.2	-40%
BETWEEN MD 450 AND US 50	2809	0.5	31.2	18.9	Yes	61.4	101.4	-39.9	-65%
MERGE US 50	4270	0.8	21.8	12.0	Yes	133.8	241.8	-108.1	-81%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	5460	1.0	26.4	27.2	Yes	141.1	136.8	4.2	3%
END 495 EXPRESS LANE	515	0.1	24.7	44.3	No	14.2	7.9	6.3	44%
BEFORE MD 202 MERGE	1817	0.3	24.0	32.4	Yes	51.7	38.3	13.4	26%
MERGE MD 202	2462	0.5	21.0	24.4	Yes	80.0	68.8	11.2	14%
BETWEEN MD 202 AND ARENA DR	1355	0.3	18.9	21.7	Yes	49.0	42.5	6.4	13%
MERGE ARENA DR	2059	0.4	19.6	25.2	Yes	71.7	55.7	16.0	22%
BETWEEN ARENA DR AND MD 214	3333	0.6	22.9	34.1	Yes	99.1	66.7	32.4	33%
MD 214 MERGE	2564	0.5	25.1	30.2	Yes	69.5	57.8	11.7	17%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	5923	1.1							
MERGE RITCHIE MARLBORO RD	3041	0.6							
BETWEEN RITCHIE MARLBORO AND MD 4	9698	1.8	42.2	51.0	Yes	156.6	129.7	26.9	17%
MERGE MD 4	2628	0.5	49.0	51.9	Yes	36.6	34.5	2.1	6%
BETWEEN MD 4 AND FORESTVILLE RD	3339	0.6	47.9	51.8	Yes	47.5	43.9	3.6	8%
MERGE FORESTVILLE RD	930	0.2	50.4	52.7	Yes	12.6	12.0	0.6	4%
BETWEEN FORESTVILLE AND MD 218	3213	0.6	52.0	61.7	Yes	42.1	35.5	6.6	16%
MERGE MD 218	1660	0.3	52.6	62.9	Yes	21.5	18.0	3.6	17%
BETWEEN MD 218 AND MD 5	6410	1.2	56.3	60.0	Yes	77.7	72.8	4.9	6%
MERGE MD 5	2751	0.5	61.4	62.8	Yes	30.6	29.9	0.7	2%
BETWEEN MD 5 AND MD 414	11958	2.3	63.6	62.9	Yes	128.2	129.6	-1.4	-1%
MERGE MD 414	3478	0.7	62.6	63.3	Yes	37.9	37.5	0.4	1%
BETWEEN MD 414 AND MD 210	2470	0.5	55.7	60.4	Yes	30.2	27.9	2.3	8%
MERGE MD 210	5648	1.1	21.9	33.4	Yes	175.5	115.3	60.3	34%
BETWEEN MD 210 AND I 295	2959	0.6	16.7	15.5	Yes	120.9	129.9	-9.1	-7%
MERGE I 295	3328	0.6	22.8	21.2	Yes	99.4	107.3	-7.8	-8%
BEFORE WOODROW WILSON BRIDGE	1217	0.2	38.4	46.9	Yes	21.6	17.7	4.0	18%
WOODROW WILSON BRIDGE	6059	1.1	42.1	52.7	Yes	98.2	78.5	19.8	20%

Figure A.22: I-495 Outer Loop 5-6 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	5-6 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)	Speed In Range?	Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-495 Outer Loop	230042	43.6				4888.5	5334.6	-446.1	-9%
WOODROW WILSON BRIDGE	6160	1.2	47.8	55.1	Yes	87.8	76.3	11.5	13%
BEFORE WOODROW WILSON BRIDGE	644	0.1	52.4	59.7	Yes	8.4	7.4	1.0	12%
MERGE I 295	1023	0.2	56.7	58.9	Yes	12.3	11.9	0.4	4%
BETWEEN MD 210 AND I 295	377	0.1	51.5	60.3	Yes	5.0	4.3	0.7	15%
MERGE MD 210	8656	1.6	48.6	57.9	Yes	121.4	102.0	19.4	16%
BETWEEN MD 414 AND MD 210	4452	0.8	50.9	56.1	Yes	59.6	54.1	5.5	9%
MERGE MD 414	2984	0.6	48.0	57.9	Yes	42.4	35.2	7.2	17%
BETWEEN MD 5 AND MD 414	12214	2.3	35.6	52.5	Yes	234.0	158.5	75.5	32%
MERGE MD 5	3740	0.7	24.6	53.1	No	103.6	48.0	55.6	54%
BETWEEN MD 218 AND MD 5	5897	1.1	24.4	41.5	Yes	164.7	96.9	67.9	41%
MERGE MD 218	238	0.0	24.3	25.6	Yes	6.7	6.3	0.3	5%
BETWEEN FORESTVILLE AND MD 218	4910	0.9	22.2	18.9	Yes	151.0	177.3	-26.3	-17%
MERGE MD 337	912	0.2	22.3	18.9	Yes	27.9	32.8	-4.9	-18%
BETWEEN MD 4 AND FORESTVILLE RD	3145	0.6	28.2	35.7	Yes	76.1	60.1	16.1	21%
MERGE MD 4	3108	0.6	31.9	45.0	Yes	66.5	47.1	19.4	29%
BETWEEN RITCHIE MARLBORO AND MD 4	9857	1.9							
MERGE RITCHIE MARLBORO RD	2341	0.4							
BETWEEN MD 214 AND RITCHIE MARLBORO RD	6303	1.2	42.8	28.9	Yes	100.5	148.9	-48.4	-48%
MERGE MD 214	2618	0.5	41.2	14.1	No	43.3	126.9	-83.6	-193%
BETWEEN ARENA DR AND MD 214	2789	0.5	34.9	14.9	No	54.5	127.9	-73.4	-135%
MERGE ARENA DR	2437	0.5	27.7	13.5	Yes	60.0	123.0	-63.0	-105%
BETWEEN MD 202 AND ARENA DR	1179	0.2	19.9	11.9	Yes	40.4	67.7	-27.2	-67%
MERGE MD 202	3055	0.6	16.7	12.2	Yes	124.4	170.7	-46.4	-37%
BEFORE MD 202 MERGE	908	0.2	18.0	9.5	Yes	34.4	65.0	-30.6	-89%
END 495 EXPRESS LANE	594	0.1	15.7	14.7	Yes	25.8	27.5	-1.7	-6%
BETWEEN US 50 AND MD 202 (495 EXPRESS LANE)	6101	1.2	24.5	29.9	Yes	169.5	139.2	30.3	18%
MERGE US 50	3680	0.7	26.1	47.0	No	96.3	53.4	42.9	45%
BETWEEN MD 450 AND US 50	2561	0.5	21.5	26.9	Yes	81.1	65.0	16.1	20%
MERGE MD 450	2100	0.4	23.0	17.2	Yes	62.3	83.2	-20.9	-33%
BETWEEN MD 295 AND MD 450	10674	2.0	28.5	16.2	Yes	255.0	449.1	-194.2	-76%
MERGE MD 295	2479	0.5	23.4	11.7	Yes	72.4	145.1	-72.7	-100%
BETWEEN MD 201 AND MD 295 MERGE	1996	0.4	23.6	13.2	Yes	57.6	103.2	-45.5	-79%
MERGE MD 201	3054	0.6	26.5	16.0	Yes	78.6	130.6	-51.9	-66%
BETWEEN GREENBELT STATION AND MD 201	4643	0.9	37.3	22.4	Yes	85.0	141.6	-56.7	-67%
BETWEEN GREENBELT STATION AND US 1	4102	0.8	54.3	30.9	No	51.5	90.5	-39.0	-76%
MERGE US 1	2739	0.5	56.1	57.0	Yes	33.3	32.8	0.5	1%
BETWEEN US 1 AND I 95	3225	0.6	54.7	57.2	Yes	40.2	38.5	1.8	4%
I 95 MERGE	4389	0.8	62.2	58.6	Yes	48.1	51.1	-3.0	-6%
BETWEEN MD 650 AND I 95	4048	0.8	48.9	53.2	Yes	56.4	51.9	4.6	8%
MERGE MD 650	2547	0.5	42.7	53.3	Yes	40.7	32.6	8.1	20%
BETWEEN MD 193 AND MD 650	6315	1.2	42.4	50.0	Yes	101.6	86.2	15.5	15%
MERGE MD 193	1353	0.3	42.2	54.0	Yes	21.9	17.1	4.8	22%
BETWEEN MD US 29 AND MD 193	2722	0.5	40.0	52.6	Yes	46.4	35.3	11.2	24%
MERGE US 29	1127	0.2	38.3	49.6	Yes	20.1	15.5	4.6	23%
BETWEEN MD 97 AND US 29	5926	1.1	37.6	49.7	Yes	107.3	81.3	26.0	24%
MD 97 MERGE	1734	0.3	35.2	52.9	Yes	33.6	22.4	11.2	33%
BETWEEN MD 185 AND MD 97	8746	1.7	39.8	51.0	Yes	149.7	116.9	32.8	22%
MD 185 MERGE	3315	0.6	43.5	45.9	Yes	51.9	49.3	2.6	5%
BETWEEN MD 355 AND MD 185	6287	1.2	38.0	44.0	Yes	112.7	97.4	15.3	14%
MD 355 MERGE	1401	0.3	36.5	41.2	Yes	26.1	23.2	2.9	11%
MERGE AFTER I 270	61	0.0	39.1	50.3	Yes	1.1	0.8	0.2	22%
MERGE BEFORE I 270	1298	0.2	36.2	49.1	Yes	24.4	18.0	6.4	26%
BETWEEN I 270 EAST AND MD 187	3092	0.6	35.6	53.0	Yes	59.1	39.8	19.4	33%
MERGE MD 187	1936	0.4	24.5	45.2	No	54.0	29.2	24.8	46%
BETWEEN I 270 WEST AND MD 187	7643	1.4	20.0	20.5	Yes	260.9	254.3	6.6	3%
MERGE I 270	1490	0.3	14.6	9.0	Yes	69.8	113.3	-43.5	-62%
BETWEEN MD 190 AND I 270	5753	1.1	16.2	13.7	Yes	242.5	286.5	-44.0	-18%
MERGE MD 190	1537	0.3	16.5	12.9	Yes	63.4	81.5	-18.2	-29%
BETWEEN CABIN JOHN PARKWAY AND MD 190	214	0.0	16.5	11.6	Yes	8.9	12.6	-3.7	-42%
MERGE CABIN JOHN PARKWAY	2397	0.5	16.4	13.1	Yes	99.6	125.1	-25.4	-26%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN P.	6336	1.2	21.8	21.2	Yes	198.2	203.4	-5.2	-3%
MERGE CLARA BARTON PARKWAY	1463	0.3	24.8	38.8	Yes	40.2	25.7	14.5	36%
BEFORE AMERICAN LEGION BRIDGE	746	0.1	31.2	48.7	Yes	16.3	10.4	5.8	36%
AMERICAN LEGION BRIDGE	790	0.1	32.1	51.8	No	16.8	10.4	6.4	38%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (2)	843	0.2	34.3	50.2	Yes	16.8	11.4	5.3	32%
GEORGE WASHINGTON MEMORIAL PKWY/EXIT 14 (1)	4288	0.8	26.9	30.6	Yes	108.6	95.6	13.0	12%
VA-193/GEORGETOWN PIKE/EXIT 13 (2)	679	0.1	24.2	20.5	Yes	19.1	22.6	-3.5	-18%
VA-193/GEORGETOWN PIKE/EXIT 13 (1)	1669	0.3	29.3	17.2	Yes	38.8	66.2	-27.4	-71%

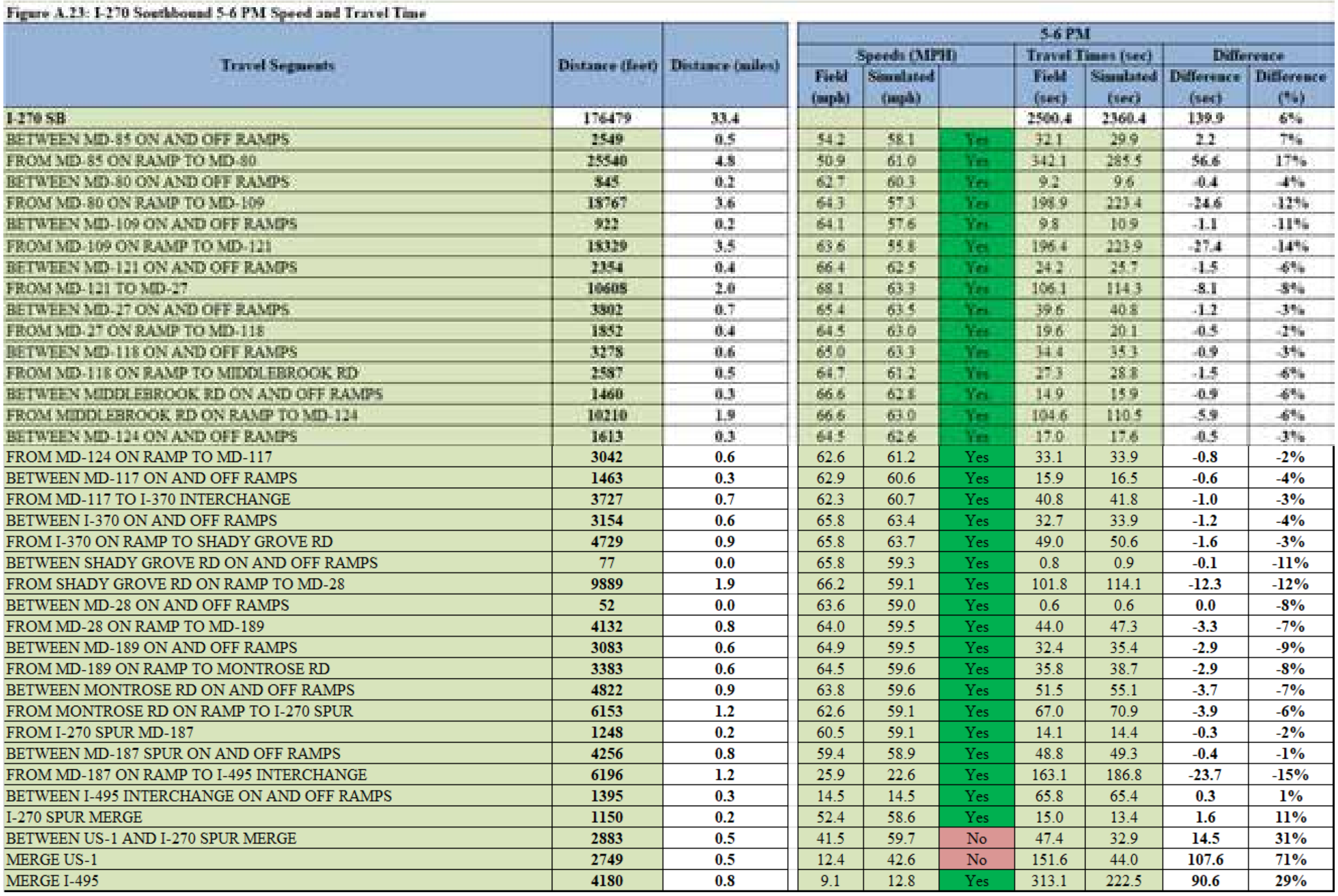


Figure A.23: I-270 Southbound 5-6 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	5-6 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)		Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 SB	176479	33.4				2500.4	2360.4	139.9	6%
BETWEEN MD-85 ON AND OFF RAMPS	2549	0.5	54.2	58.1	Yes	32.1	29.9	2.2	7%
FROM MD-85 ON RAMP TO MD-80	25540	4.8	50.9	61.0	Yes	342.1	285.5	56.6	17%
BETWEEN MD-80 ON AND OFF RAMPS	845	0.2	62.7	60.3	Yes	9.2	9.6	-0.4	-4%
FROM MD-80 ON RAMP TO MD-109	18767	3.6	64.3	57.3	Yes	198.9	223.4	-24.6	-12%
BETWEEN MD-109 ON AND OFF RAMPS	922	0.2	64.1	57.6	Yes	9.8	10.9	-1.1	-11%
FROM MD-109 ON RAMP TO MD-121	18329	3.5	63.6	55.8	Yes	196.4	223.9	-27.4	-14%
BETWEEN MD-121 ON AND OFF RAMPS	2354	0.4	66.4	62.5	Yes	24.2	25.7	-1.5	-6%
FROM MD-121 TO MD-27	10608	2.0	68.1	63.3	Yes	106.1	114.3	-8.1	-8%
BETWEEN MD-27 ON AND OFF RAMPS	3802	0.7	65.4	63.5	Yes	39.6	40.8	-1.2	-3%
FROM MD-27 ON RAMP TO MD-118	1852	0.4	64.5	63.0	Yes	19.6	20.1	-0.5	-2%
BETWEEN MD-118 ON AND OFF RAMPS	3278	0.6	65.0	63.3	Yes	34.4	35.3	-0.9	-3%
FROM MD-118 ON RAMP TO MIDDLEBROOK RD	2587	0.5	64.7	61.2	Yes	27.3	28.8	-1.5	-6%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMPS	1460	0.3	66.6	62.8	Yes	14.9	15.9	-0.9	-6%
FROM MIDDLEBROOK RD ON RAMP TO MD-124	10210	1.9	66.6	63.0	Yes	104.6	110.5	-5.9	-6%
BETWEEN MD-124 ON AND OFF RAMPS	1613	0.3	64.5	62.6	Yes	17.0	17.6	-0.5	-3%
FROM MD-124 ON RAMP TO MD-117	3042	0.6	62.6	61.2	Yes	33.1	33.9	-0.8	-2%
BETWEEN MD-117 ON AND OFF RAMPS	1463	0.3	62.9	60.6	Yes	15.9	16.5	-0.6	-4%
FROM MD-117 TO I-370 INTERCHANGE	3727	0.7	62.3	60.7	Yes	40.8	41.8	-1.0	-3%
BETWEEN I-370 ON AND OFF RAMPS	3154	0.6	65.8	63.4	Yes	32.7	33.9	-1.2	-4%
FROM I-370 ON RAMP TO SHADY GROVE RD	4729	0.9	65.8	63.7	Yes	49.0	50.6	-1.6	-3%
BETWEEN SHADY GROVE RD ON AND OFF RAMPS	77	0.0	65.8	59.3	Yes	0.8	0.9	-0.1	-11%
FROM SHADY GROVE RD ON RAMP TO MD-28	9889	1.9	66.2	59.1	Yes	101.8	114.1	-12.3	-12%
BETWEEN MD-28 ON AND OFF RAMPS	52	0.0	63.6	59.0	Yes	0.6	0.6	0.0	-8%
FROM MD-28 ON RAMP TO MD-189	4132	0.8	64.0	59.5	Yes	44.0	47.3	-3.3	-7%
BETWEEN MD-189 ON AND OFF RAMPS	3083	0.6	64.9	59.5	Yes	32.4	35.4	-2.9	-9%
FROM MD-189 ON RAMP TO MONTROSE RD	3383	0.6	64.5	59.6	Yes	35.8	38.7	-2.9	-8%
BETWEEN MONTROSE RD ON AND OFF RAMPS	4822	0.9	63.8	59.6	Yes	51.5	55.1	-3.7	-7%
FROM MONTROSE RD ON RAMP TO I-270 SPUR	6153	1.2	62.6	59.1	Yes	67.0	70.9	-3.9	-6%
FROM I-270 SPUR MD-187	1248	0.2	60.5	59.1	Yes	14.1	14.4	-0.3	-2%
BETWEEN MD-187 SPUR ON AND OFF RAMPS	4256	0.8	59.4	58.9	Yes	48.8	49.3	-0.4	-1%
FROM MD-187 ON RAMP TO I-495 INTERCHANGE	6196	1.2	25.9	22.6	Yes	163.1	186.8	-23.7	-15%
BETWEEN I-495 INTERCHANGE ON AND OFF RAMPS	1395	0.3	14.5	14.5	Yes	65.8	65.4	0.3	1%
I-270 SPUR MERGE	1150	0.2	52.4	58.6	Yes	15.0	13.4	1.6	11%
BETWEEN US-1 AND I-270 SPUR MERGE	2883	0.5	41.5	59.7	No	47.4	32.9	14.5	31%
MERGE US-1	2749	0.5	12.4	42.6	No	151.6	44.0	107.6	71%
MERGE I-495	4180	0.8	9.1	12.8	Yes	313.1	222.5	90.6	29%

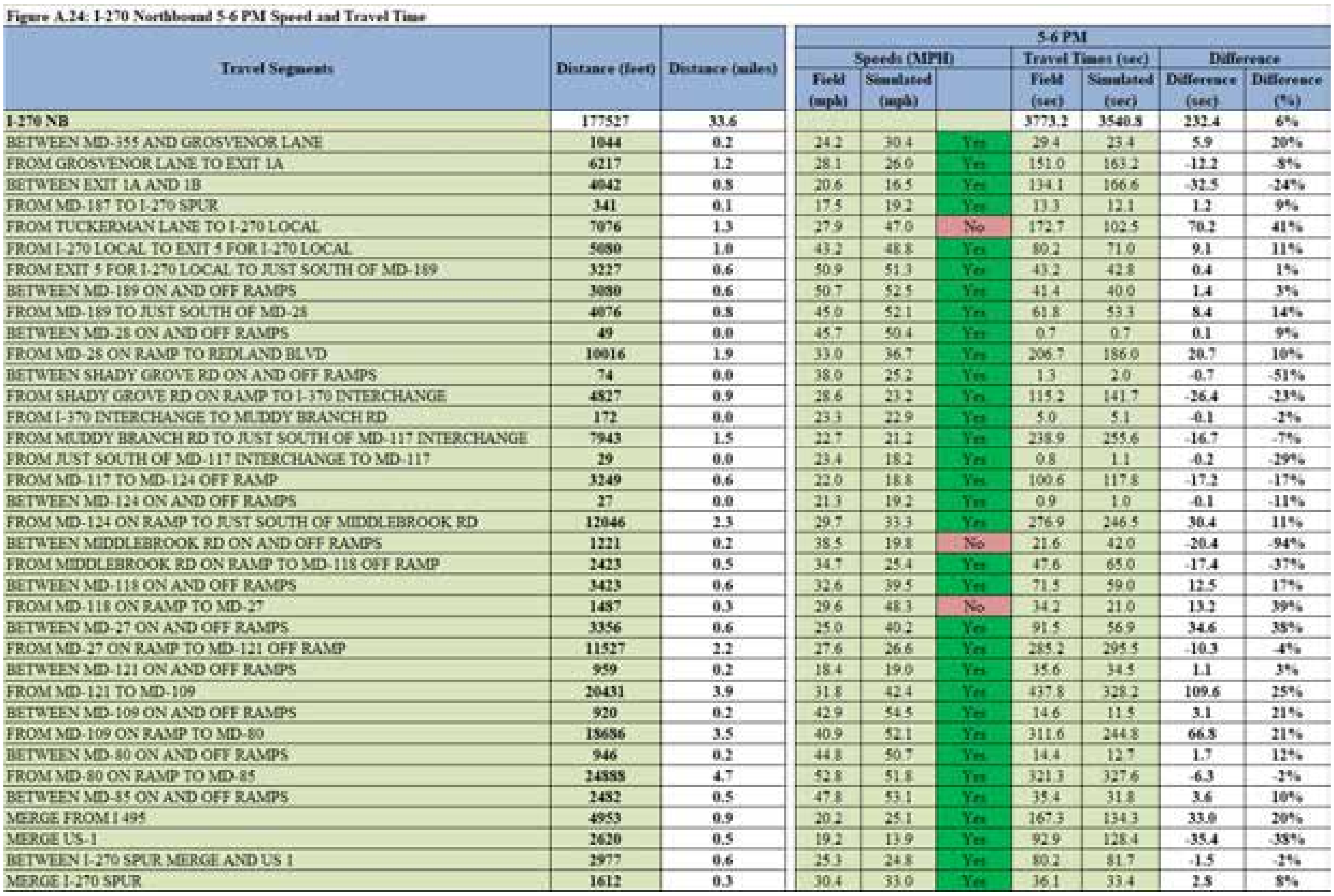


Figure A.24: I-270 Northbound 5-6 PM Speed and Travel Time

Travel Segments	Distance (feet)	Distance (miles)	5-6 PM						
			Speeds (MPH)			Travel Times (sec)		Difference	
			Field (mph)	Simulated (mph)		Field (sec)	Simulated (sec)	Difference (sec)	Difference (%)
I-270 NB	177527	33.6				3773.2	3540.8	232.4	6%
BETWEEN MD-355 AND GROSVENOR LANE	1044	0.2	24.2	30.4	Yes	29.4	23.4	5.9	20%
FROM GROSVENOR LANE TO EXIT 1A	6217	1.2	28.1	26.0	Yes	151.0	163.2	-12.2	-8%
BETWEEN EXIT 1A AND 1B	4042	0.8	20.6	16.5	Yes	134.1	166.6	-32.5	-24%
FROM MD-187 TO I-270 SPUR	341	0.1	17.5	19.2	Yes	13.3	12.1	1.2	9%
FROM TUCKERMAN LANE TO I-270 LOCAL	7076	1.3	27.9	47.0	No	172.7	102.5	70.2	41%
FROM I-270 LOCAL TO EXIT 5 FOR I-270 LOCAL	5080	1.0	43.2	48.8	Yes	80.2	71.0	9.1	11%
FROM EXIT 5 FOR I-270 LOCAL TO JUST SOUTH OF MD-189	3227	0.6	50.9	51.3	Yes	43.2	42.8	0.4	1%
BETWEEN MD-189 ON AND OFF RAMPS	3080	0.6	50.7	52.5	Yes	41.4	40.0	1.4	3%
FROM MD-189 TO JUST SOUTH OF MD-28	4076	0.8	45.0	52.1	Yes	61.8	53.3	8.4	14%
BETWEEN MD-28 ON AND OFF RAMPS	49	0.0	45.7	50.4	Yes	0.7	0.7	0.1	9%
FROM MD-28 ON RAMP TO REDLAND BLVD	10016	1.9	33.0	36.7	Yes	206.7	186.0	20.7	10%
BETWEEN SHADY GROVE RD ON AND OFF RAMPS	74	0.0	38.0	25.2	Yes	1.3	2.0	-0.7	-51%
FROM SHADY GROVE RD ON RAMP TO I-370 INTERCHANGE	4827	0.9	28.6	23.2	Yes	115.2	141.7	-26.4	-23%
FROM I-370 INTERCHANGE TO MUDDY BRANCH RD	172	0.0	23.3	22.9	Yes	5.0	5.1	-0.1	-2%
FROM MUDDY BRANCH RD TO JUST SOUTH OF MD-117 INTERCHANGE	7943	1.5	22.7	21.2	Yes	238.9	255.6	-16.7	-7%
FROM JUST SOUTH OF MD-117 INTERCHANGE TO MD-117	29	0.0	23.4	18.2	Yes	0.8	1.1	-0.2	-29%
FROM MD-117 TO MD-124 OFF RAMP	3249	0.6	22.0	18.8	Yes	100.6	117.8	-17.2	-17%
BETWEEN MD-124 ON AND OFF RAMPS	27	0.0	21.3	19.2	Yes	0.9	1.0	-0.1	-11%
FROM MD-124 ON RAMP TO JUST SOUTH OF MIDDLEBROOK RD	12046	2.3	29.7	33.3	Yes	276.9	246.5	30.4	11%
BETWEEN MIDDLEBROOK RD ON AND OFF RAMPS	1221	0.2	38.5	19.8	No	21.6	42.0	-20.4	-94%
FROM MIDDLEBROOK RD ON RAMP TO MD-118 OFF RAMP	2423	0.5	34.7	25.4	Yes	47.6	65.0	-17.4	-37%
BETWEEN MD-118 ON AND OFF RAMPS	3423	0.6	32.6	39.5	Yes	71.5	59.0	12.5	17%
FROM MD-118 ON RAMP TO MD-27	1487	0.3	29.6	48.3	No	34.2	21.0	13.2	39%
BETWEEN MD-27 ON AND OFF RAMPS	3356	0.6	25.0	40.2	Yes	91.5	56.9	34.6	38%
FROM MD-27 ON RAMP TO MD-121 OFF RAMP	11527	2.2	27.6	26.6	Yes	285.2	295.5	-10.3	-4%
BETWEEN MD-121 ON AND OFF RAMPS	959	0.2	18.4	19.0	Yes	35.6	34.5	1.1	3%
FROM MD-121 TO MD-109	20431	3.9	31.8	42.4	Yes	437.8	328.2	109.6	25%
BETWEEN MD-109 ON AND OFF RAMPS	920	0.2	42.9	54.5	Yes	14.6	11.5	3.1	21%
FROM MD-109 ON RAMP TO MD-80	18686	3.5	40.9	52.1	Yes	311.6	244.8	66.8	21%
BETWEEN MD-80 ON AND OFF RAMPS	946	0.2	44.8	50.7	Yes	14.4	12.7	1.7	12%
FROM MD-80 ON RAMP TO MD-85	24888	4.7	52.8	51.8	Yes	321.3	327.6	-6.3	-2%
BETWEEN MD-85 ON AND OFF RAMPS	2482	0.5	47.8	53.1	Yes	35.4	31.8	3.6	10%
MERGE FROM I 495	4953	0.9	20.2	25.1	Yes	167.3	134.3	33.0	20%
MERGE US-1	2620	0.5	19.2	13.9	Yes	92.9	128.4	-35.4	-38%
BETWEEN I-270 SPUR MERGE AND US 1	2977	0.6	25.3	24.8	Yes	80.2	81.7	-1.5	-2%
MERGE I-270 SPUR	1612	0.3	30.4	33.0	Yes	36.1	33.4	2.8	8%

APPENDIX B

Travel Time Charts

Figure B.1: I-495 Inner Loop – 7-8 AM VISSIM Model and INRIX Travel Time Comparison

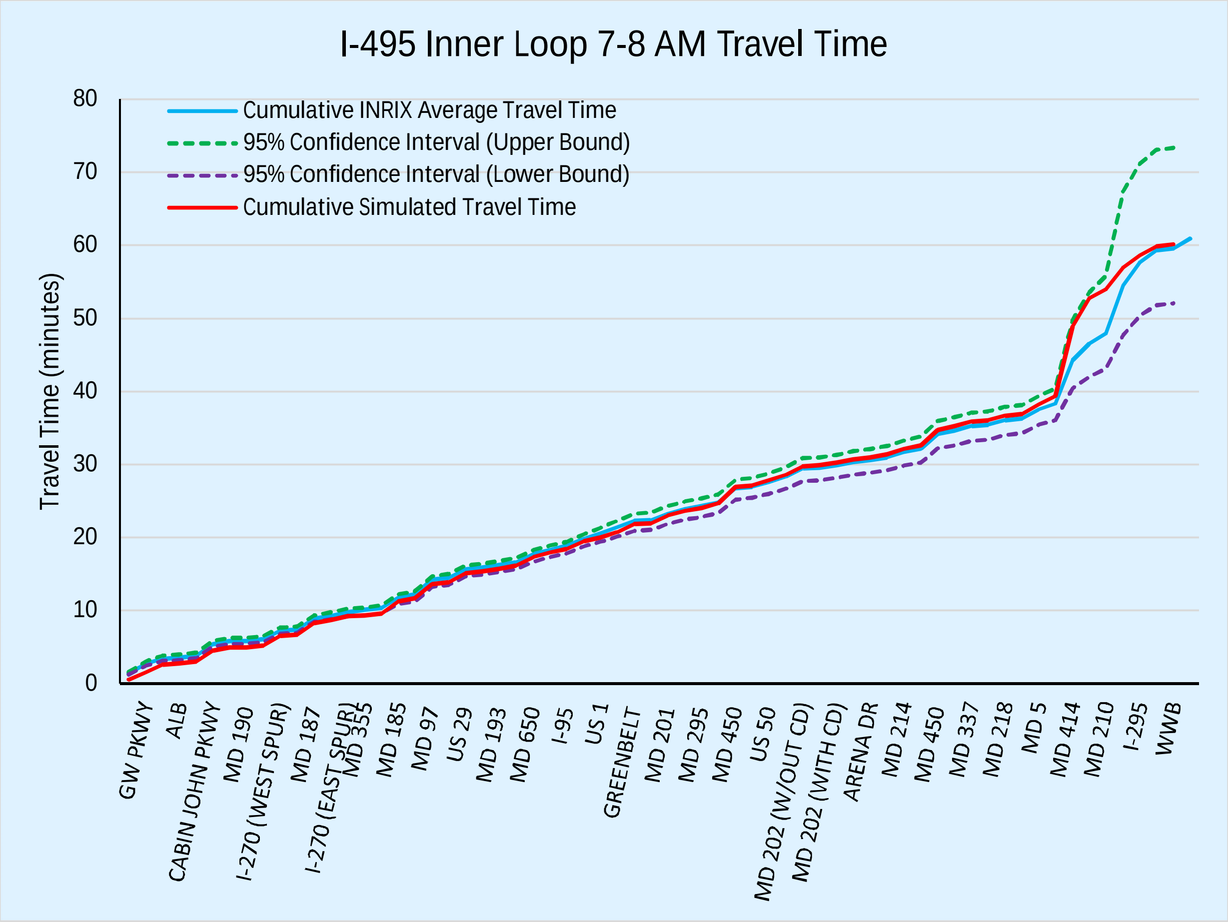


Figure B.2: I-495 Inner Loop – 8-9 AM VISSIM Model and INRIX Travel Time Comparison

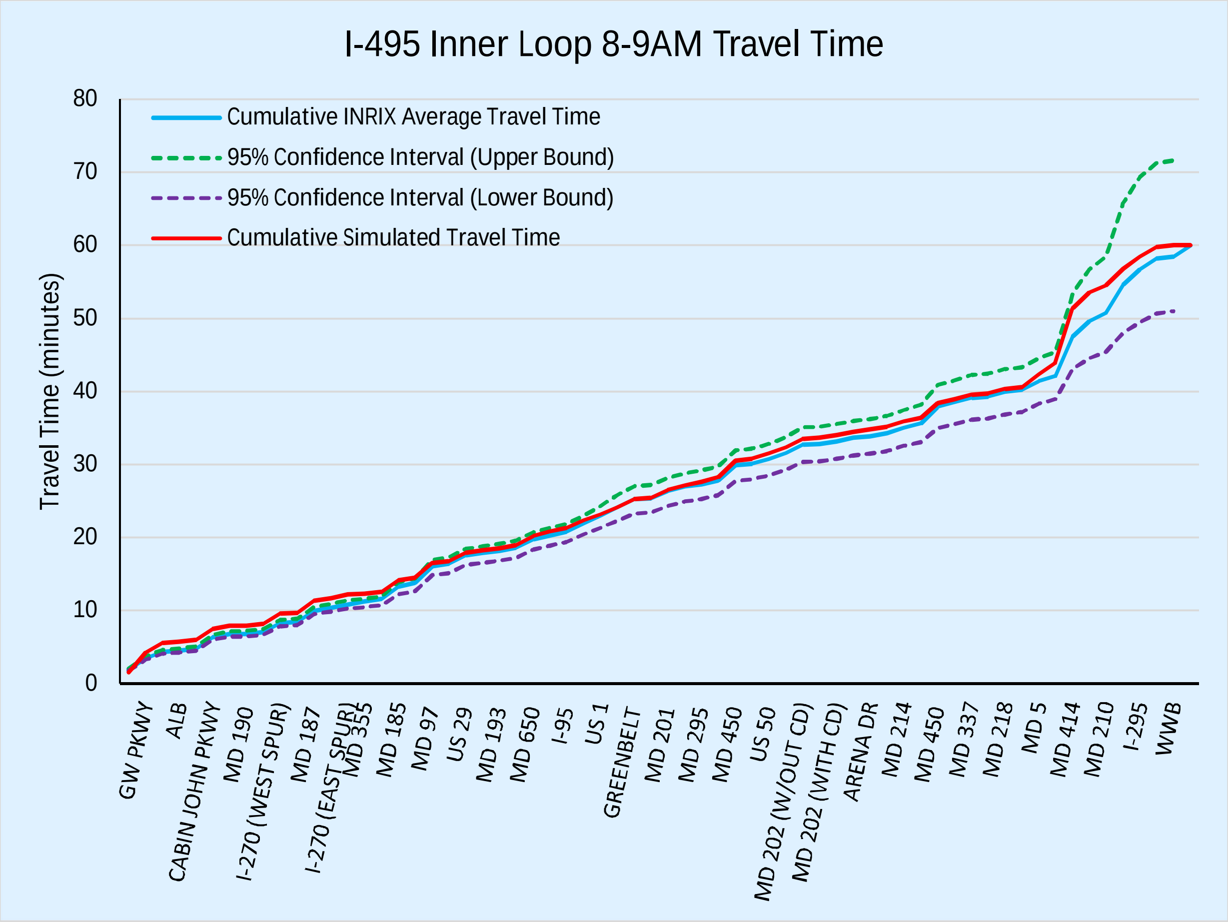


Figure B.3: I-495 Inner Loop – 4-5 PM VISSIM Model and INRIX Travel Time Comparison

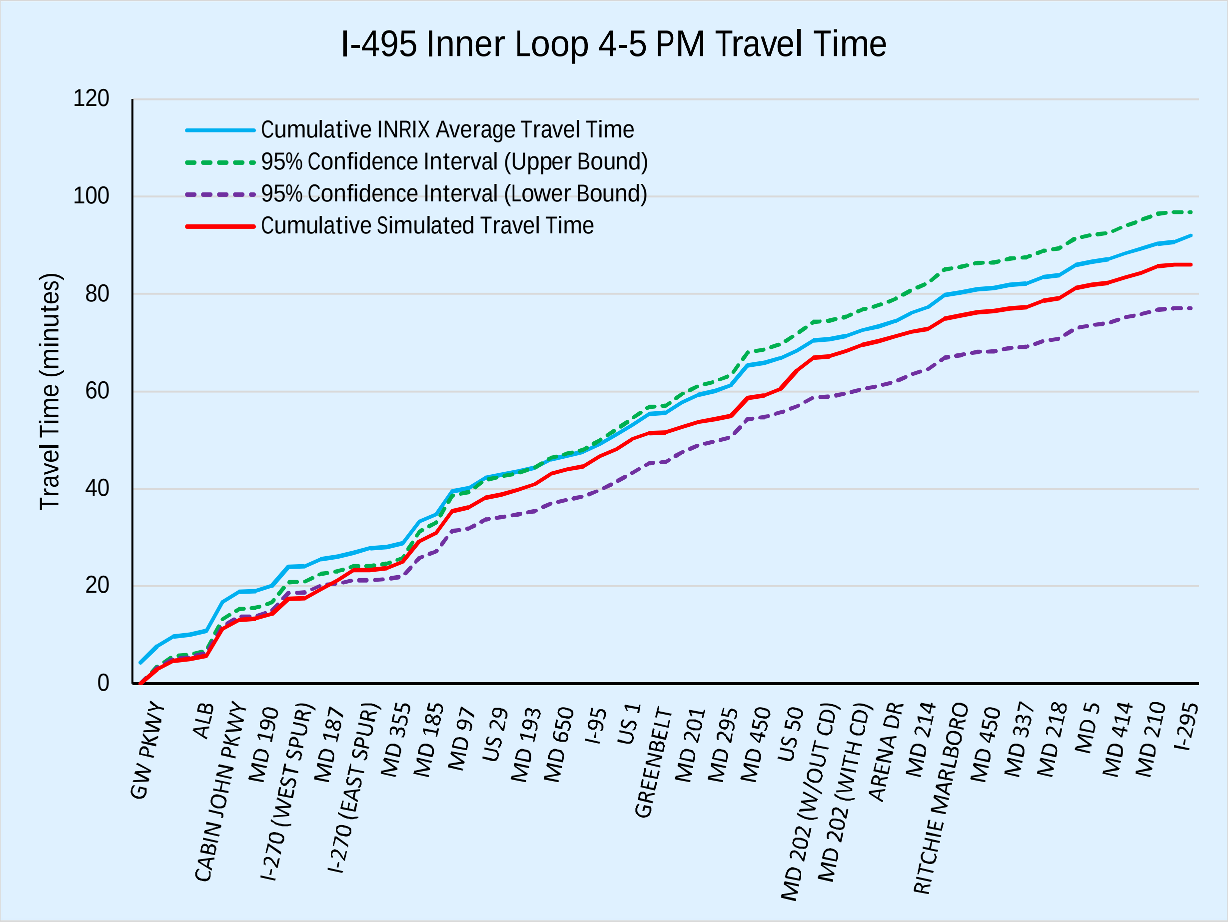


Figure B.4: I-495 Inner Loop – 5-6 PM VISSIM Model and INRIX Travel Time Comparison

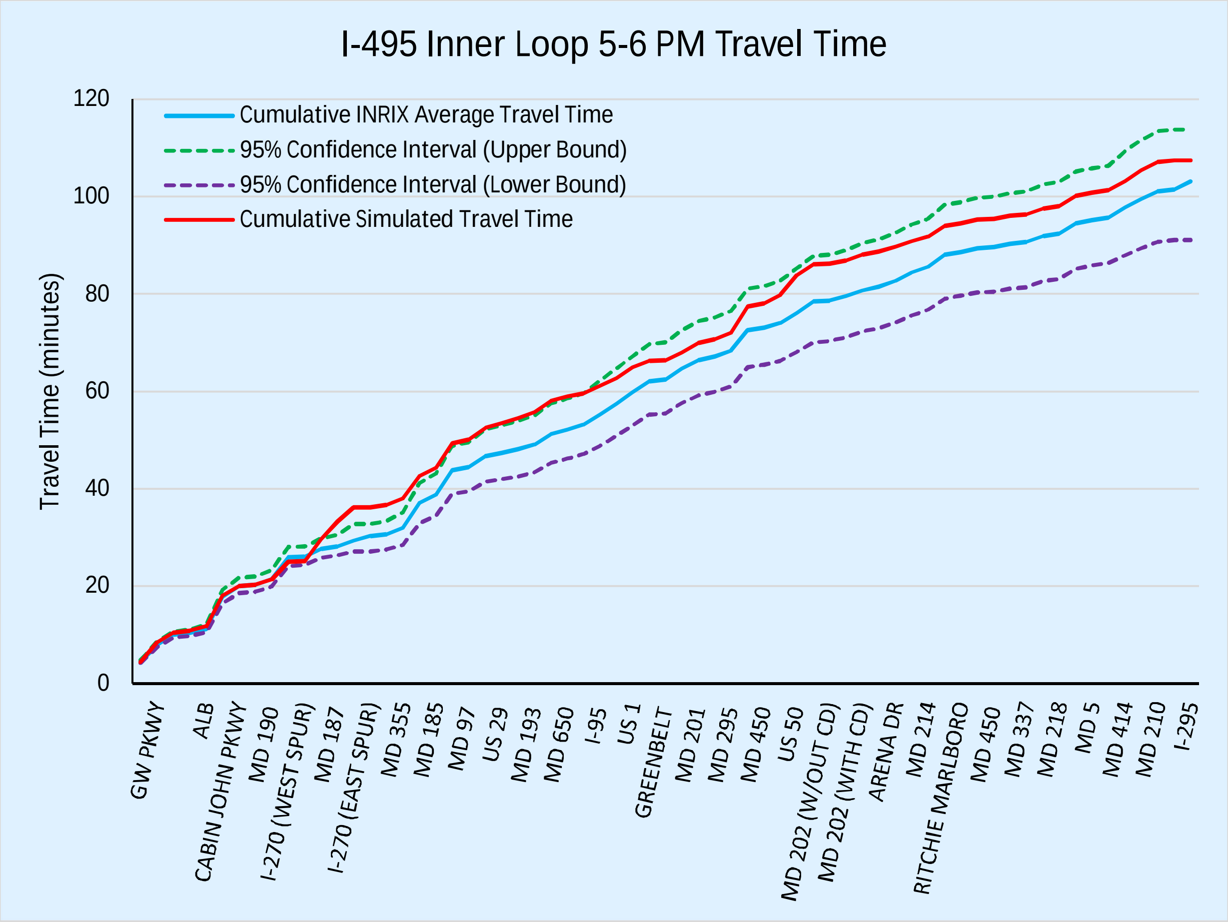


Figure B.5: I-495 Outer Loop – 7-8 AM VISSIM Model and INRIX Travel Time Comparison

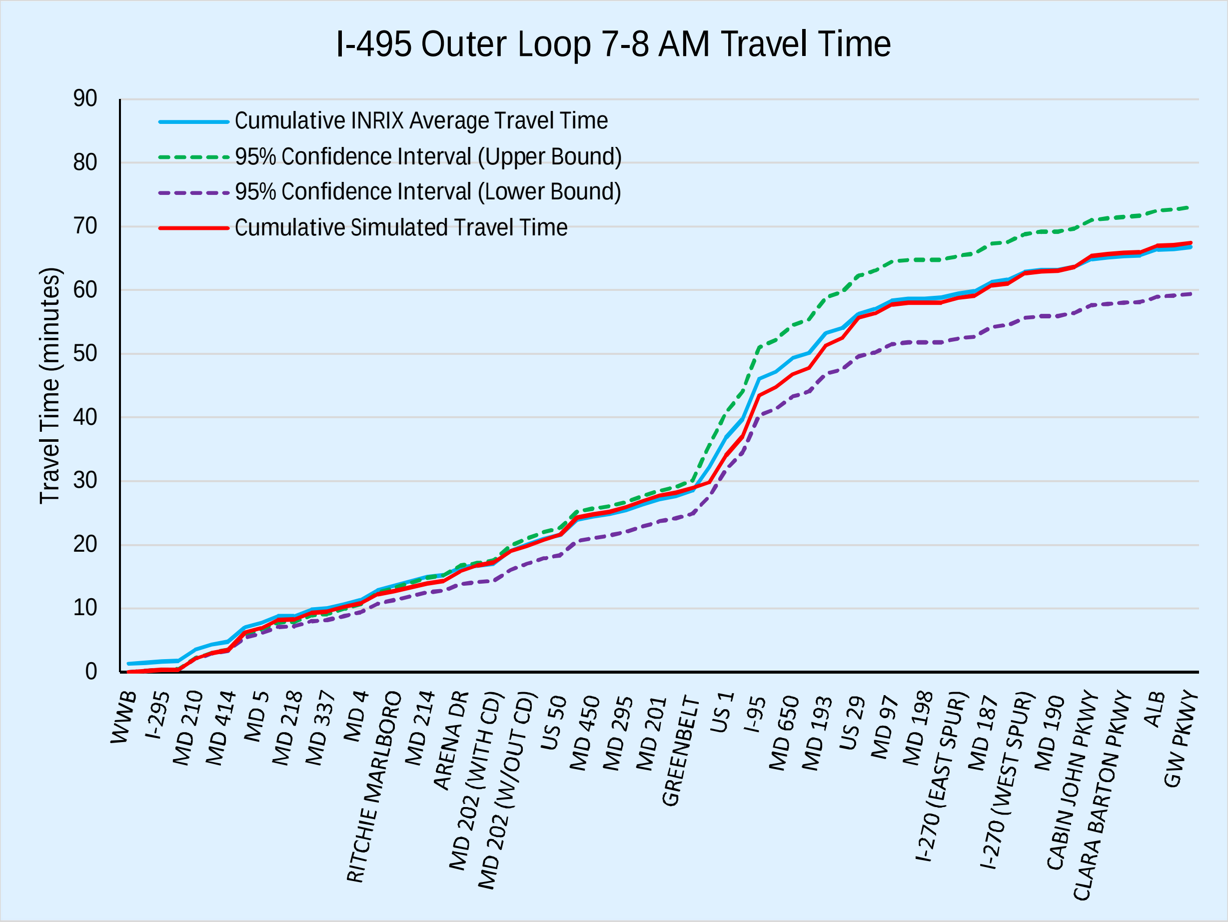


Figure B.6: I-495 Outer Loop – 8-9 AM VISSIM Model and INRIX Travel Time Comparison

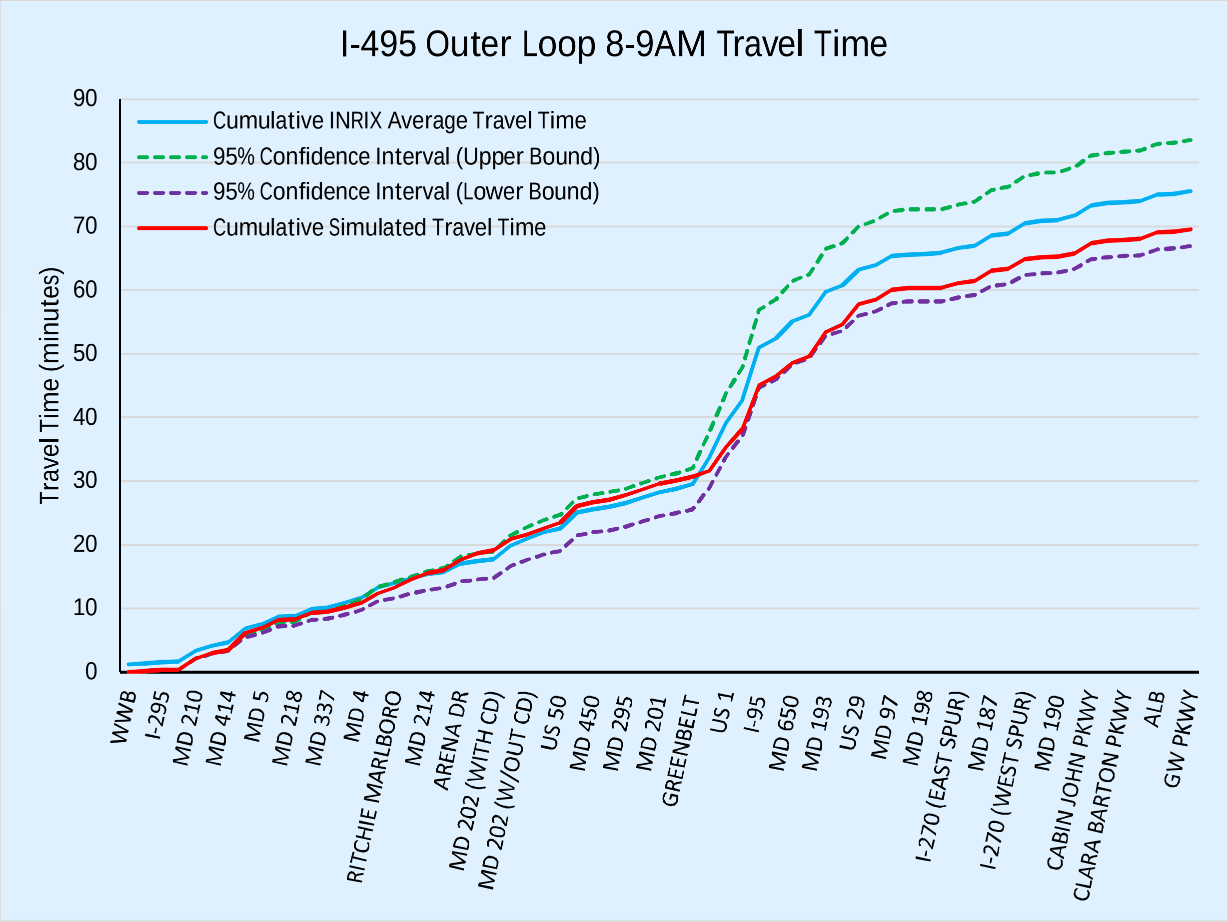


Figure B.7: I-495 Outer Loop – 4-5 PM VISSIM Model and INRIX Travel Time Comparison

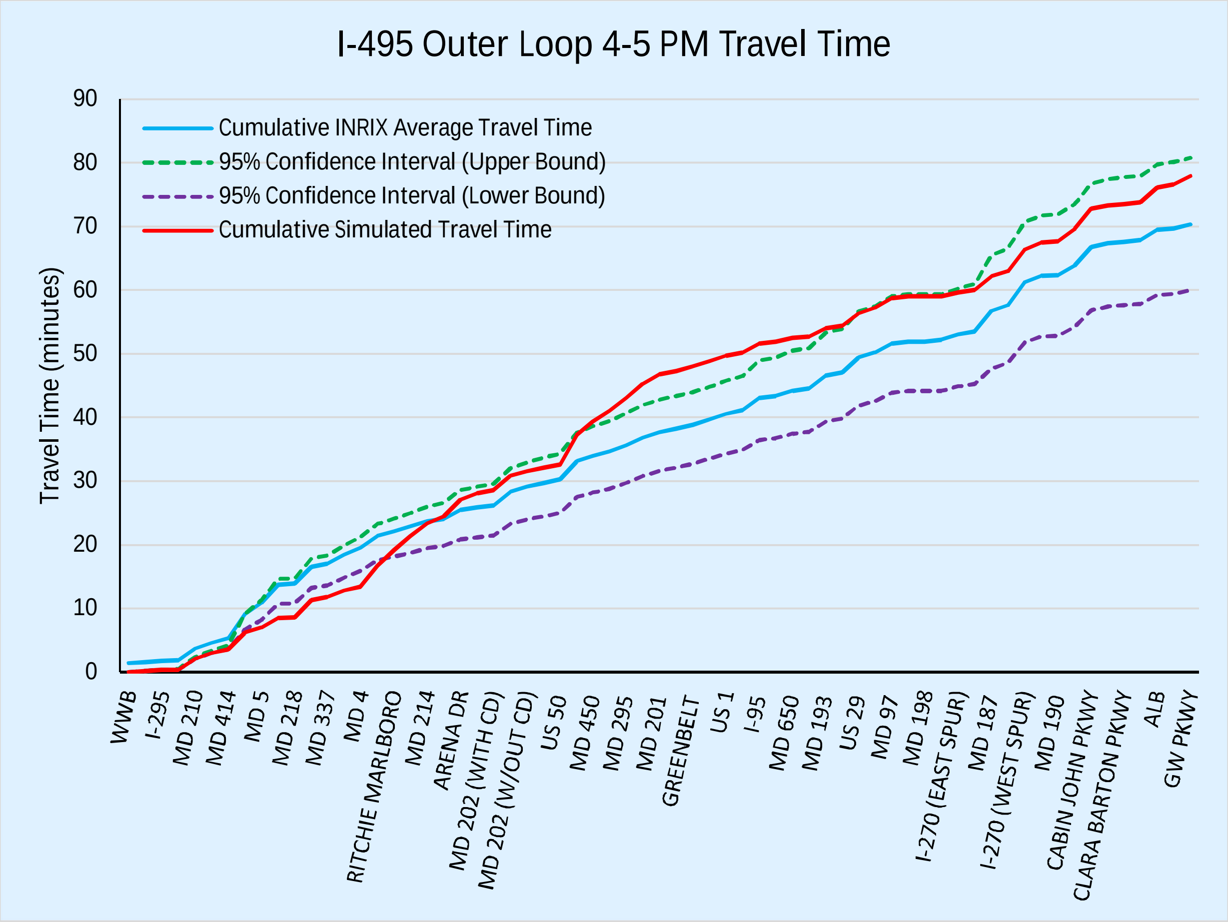


Figure B.8: I-495 Outer Loop – 5-6 PM VISSIM Model and INRIX Travel Time Comparison

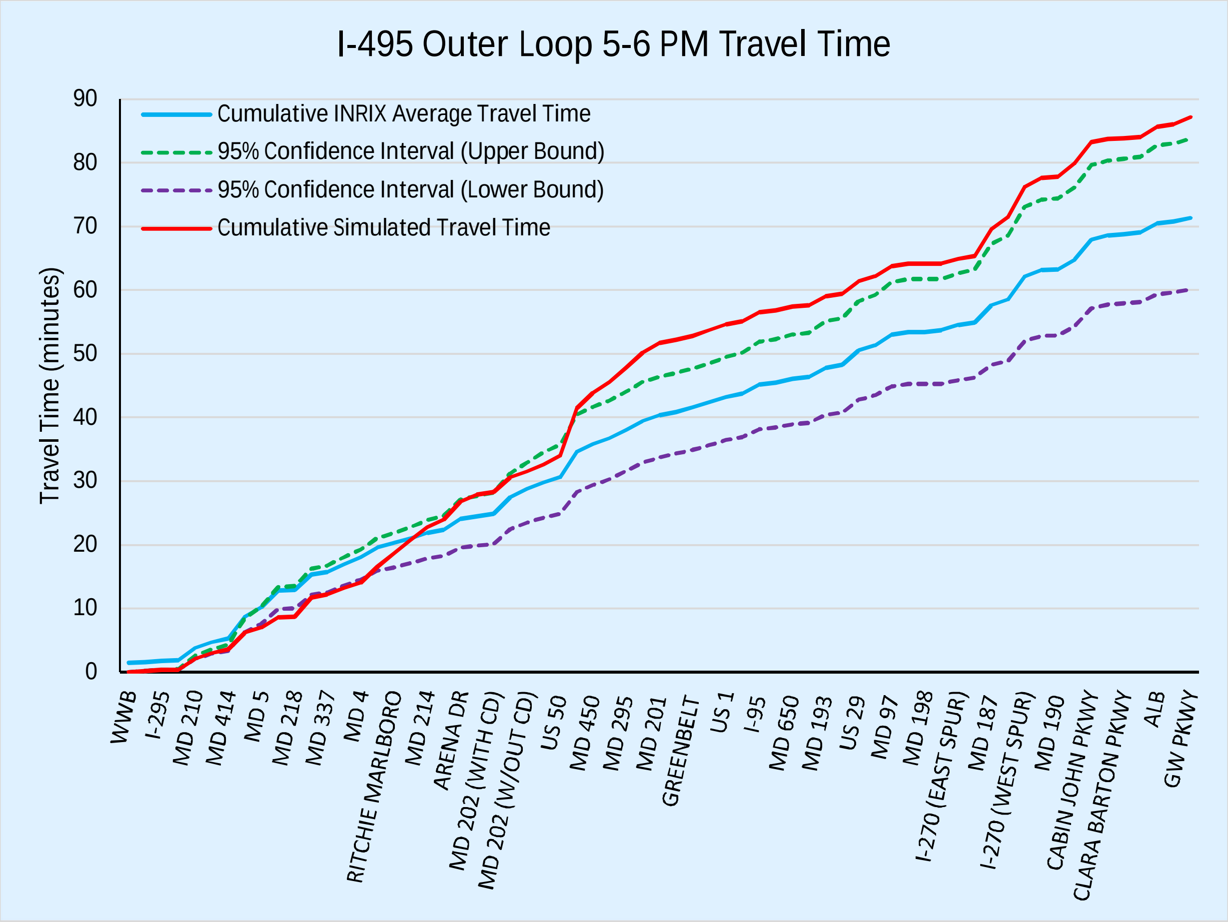


Figure B.9: I-270 Southbound – 7-8 AM VISSIM Model and INRIX Travel Time Comparison

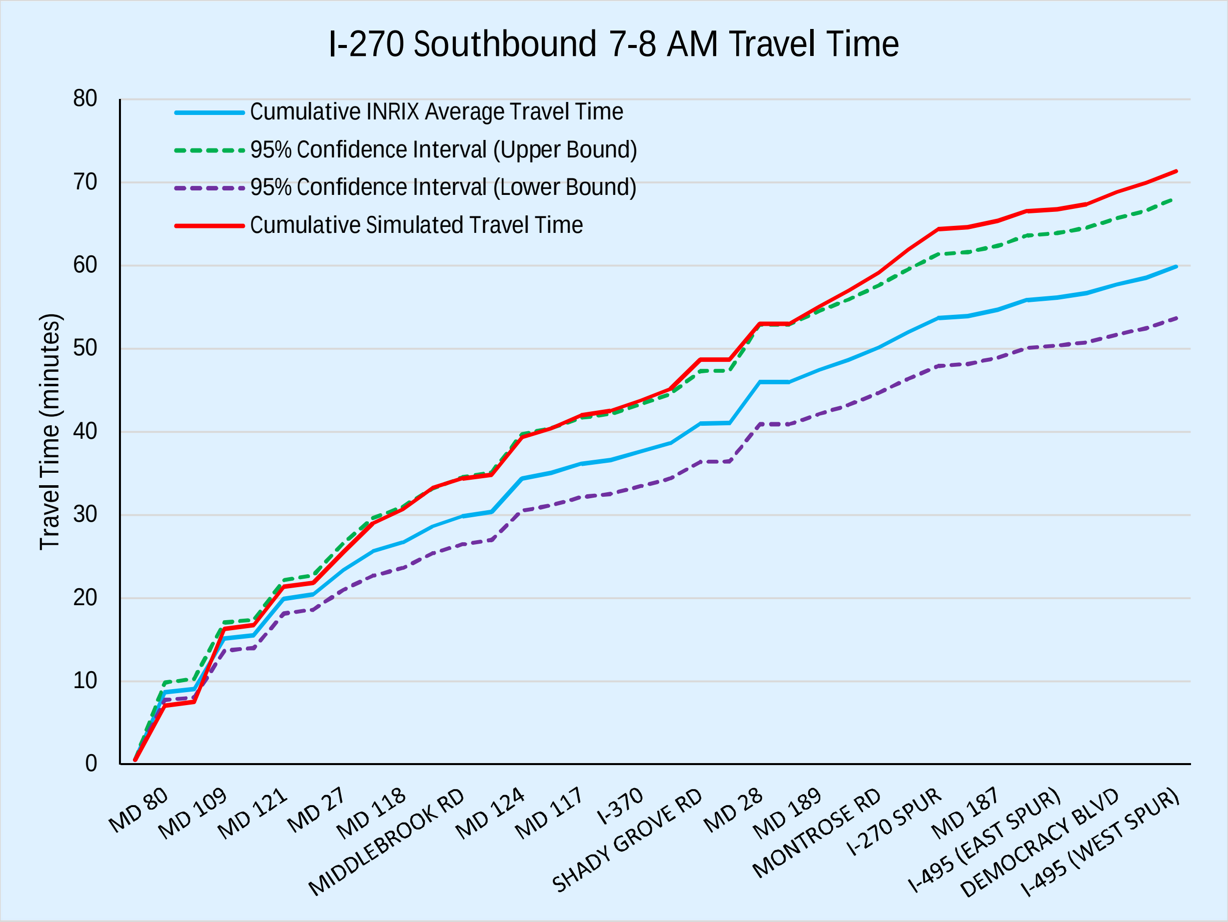


Figure B.10: I-270 Southbound – 8-9 AM VISSIM Model and INRIX Travel Time Comparison

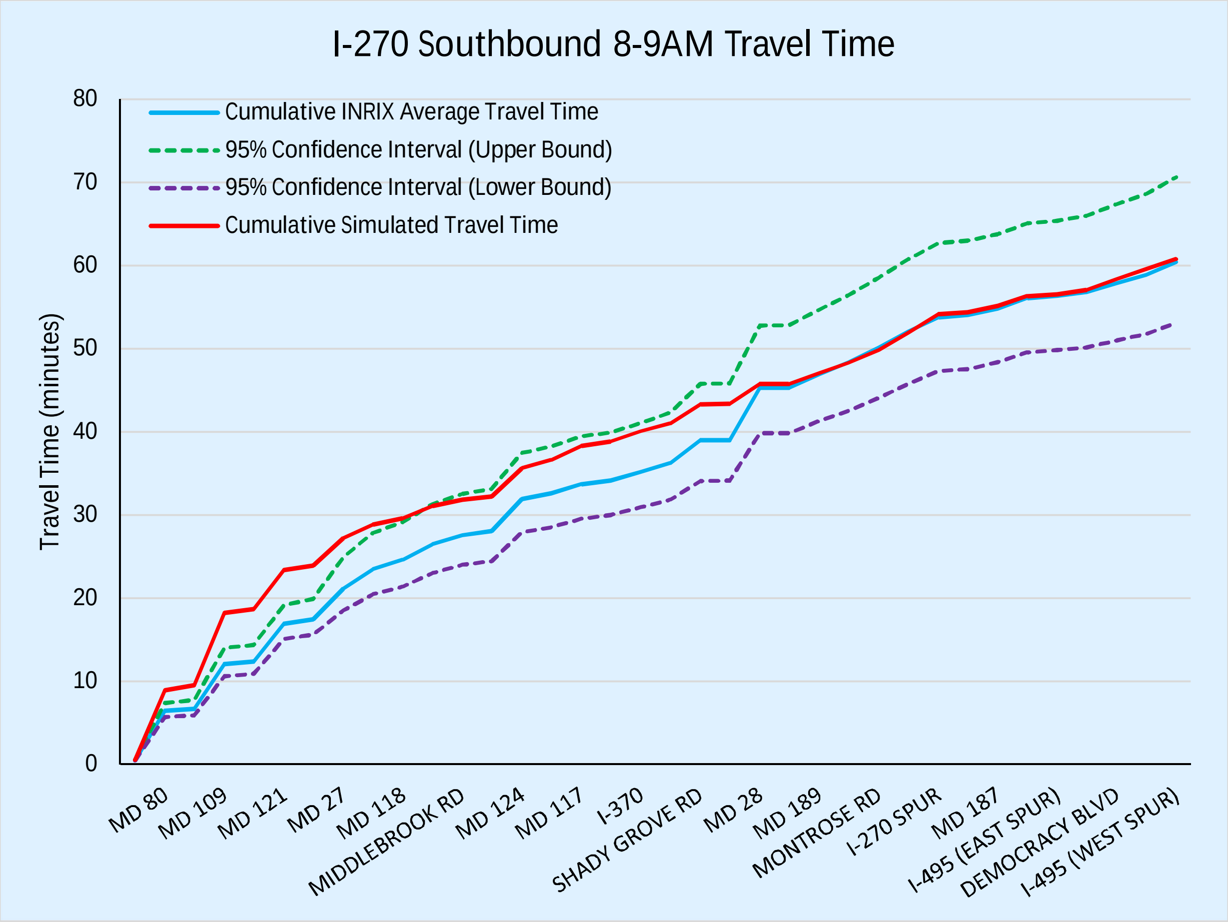


Figure B.11: I-270 Southbound – 4-5 PM VISSIM Model and INRIX Travel Time Comparison

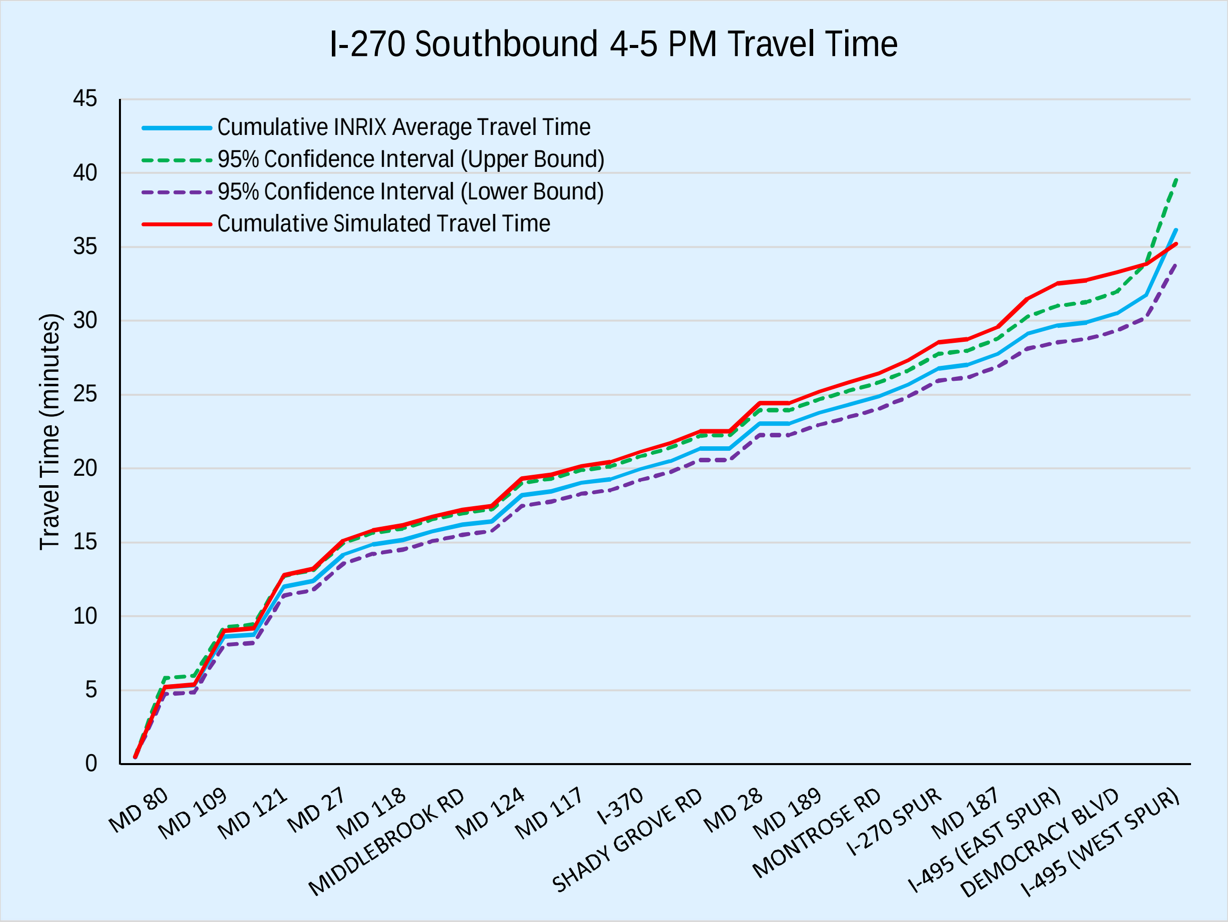


Figure B.12: I-270 Southbound – 5-6 PM VISSIM Model and INRIX Travel Time Comparison

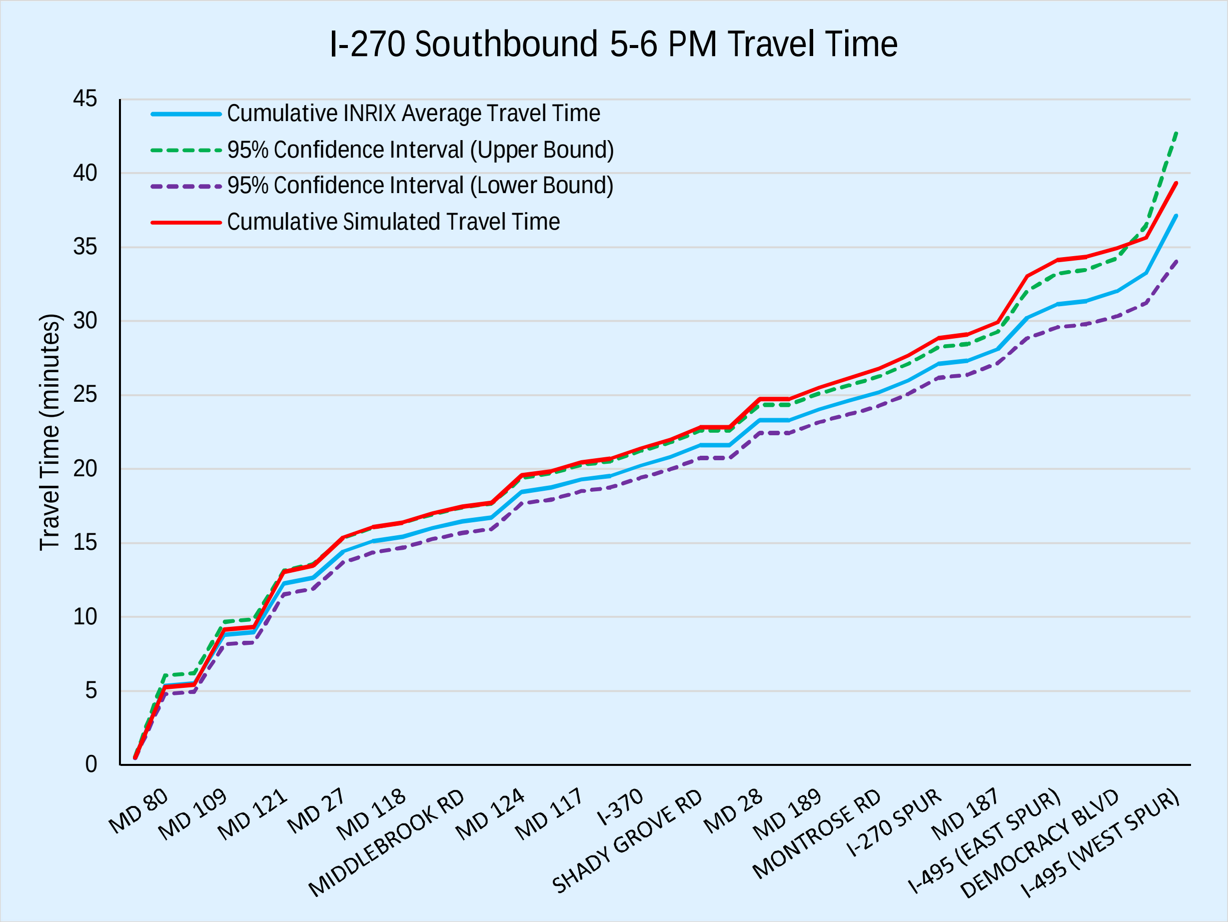


Figure B.13: I-270 Northbound – 7-8 AM VISSIM Model and INRIX Travel Time Comparison

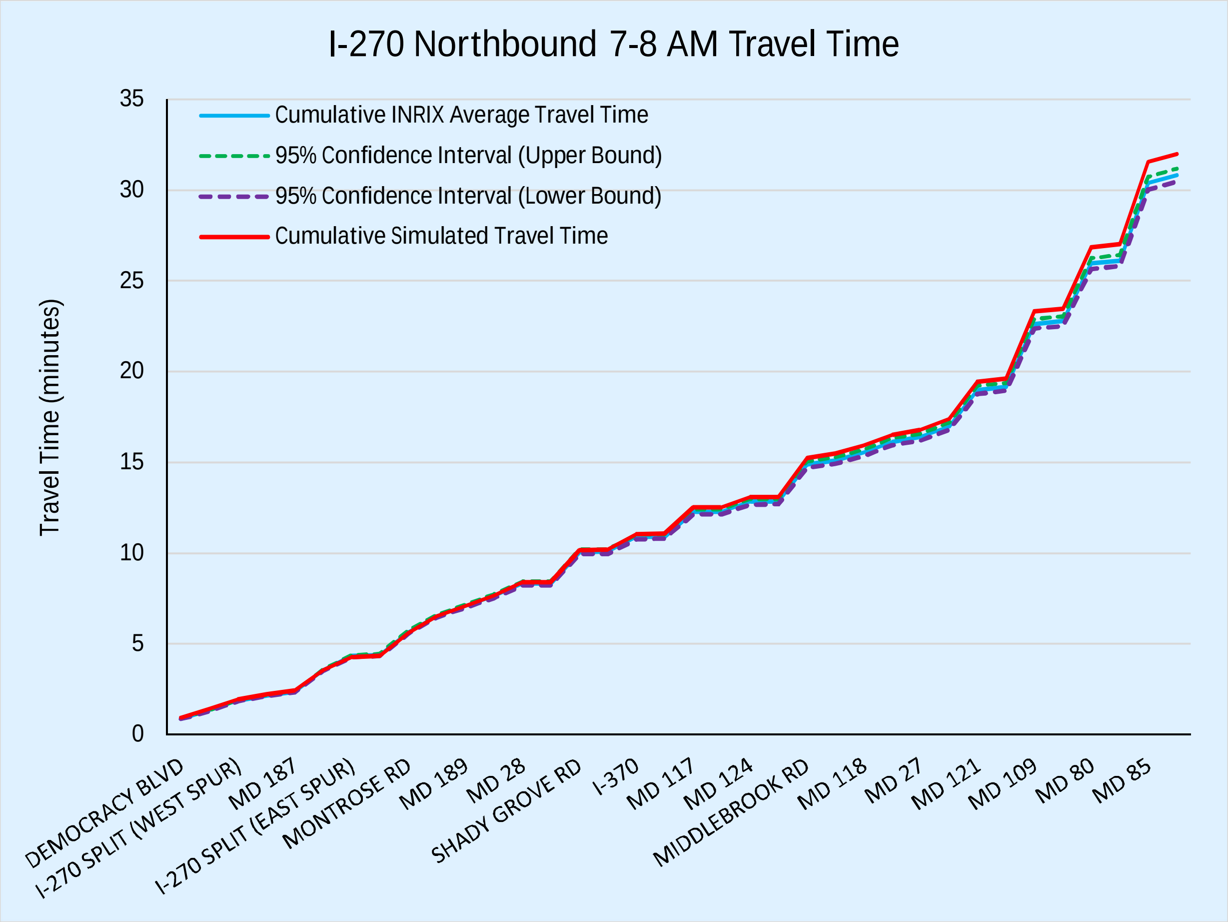


Figure B.14: I-270 Northbound – 8-9 AM VISSIM Model and INRIX Travel Time Comparison

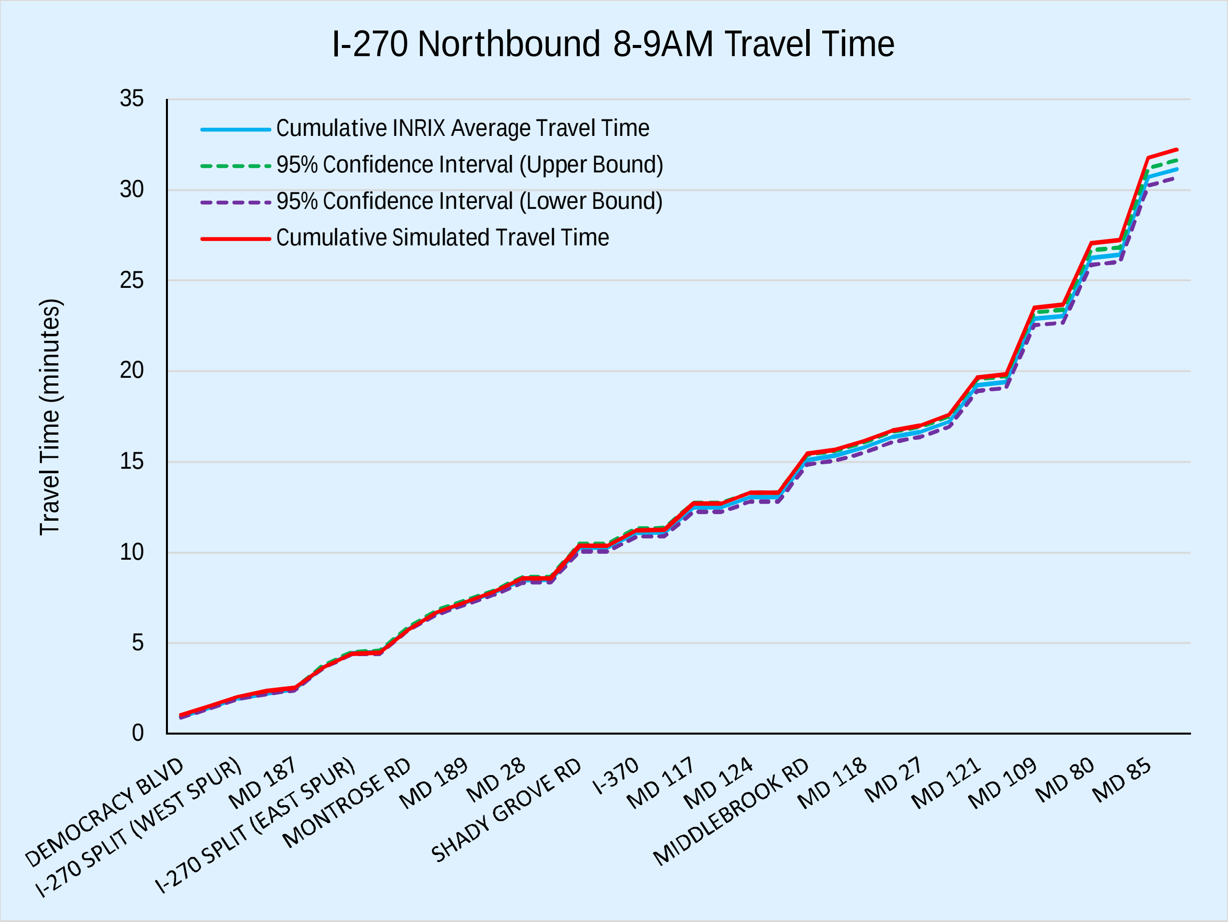


Figure B.15: I-270 Northbound – 4-5 PM VISSIM Model and INRIX Travel Time Comparison

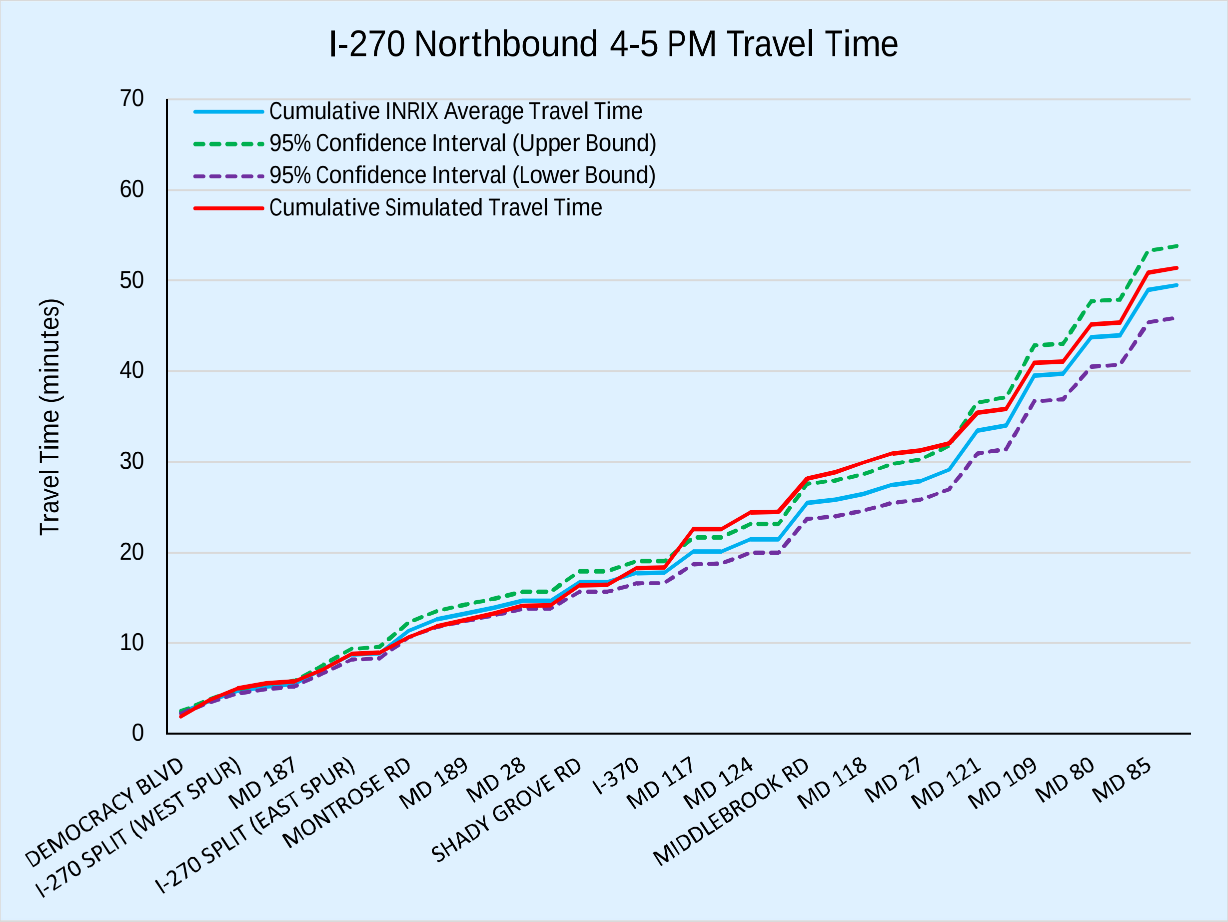


Figure B.16: I-270 Northbound – 5-6 PM VISSIM Model and INRIX Travel Time Comparison

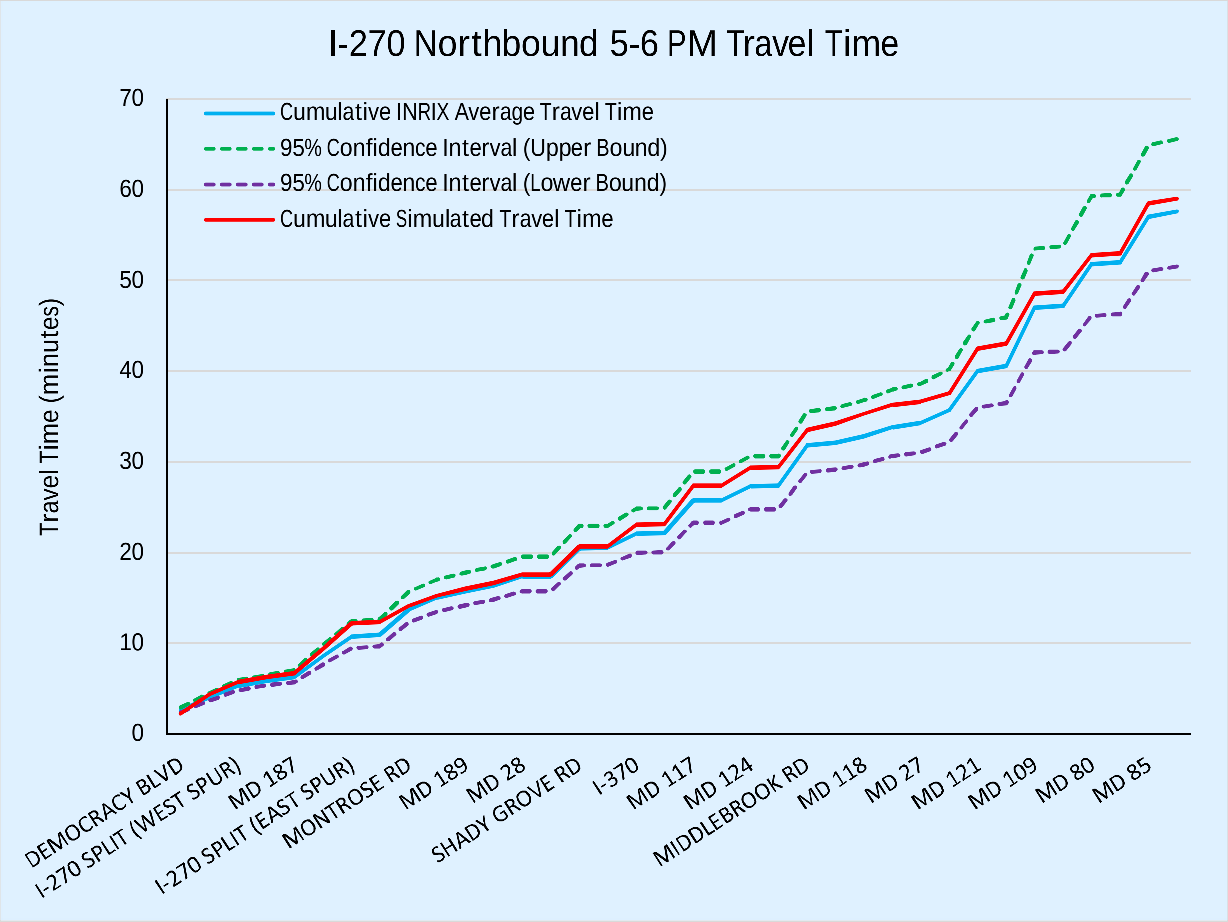


Figure B.17: I-495 Inner Loop – 7-8 AM VISSIM Model and May 2017 Travel Time Comparison

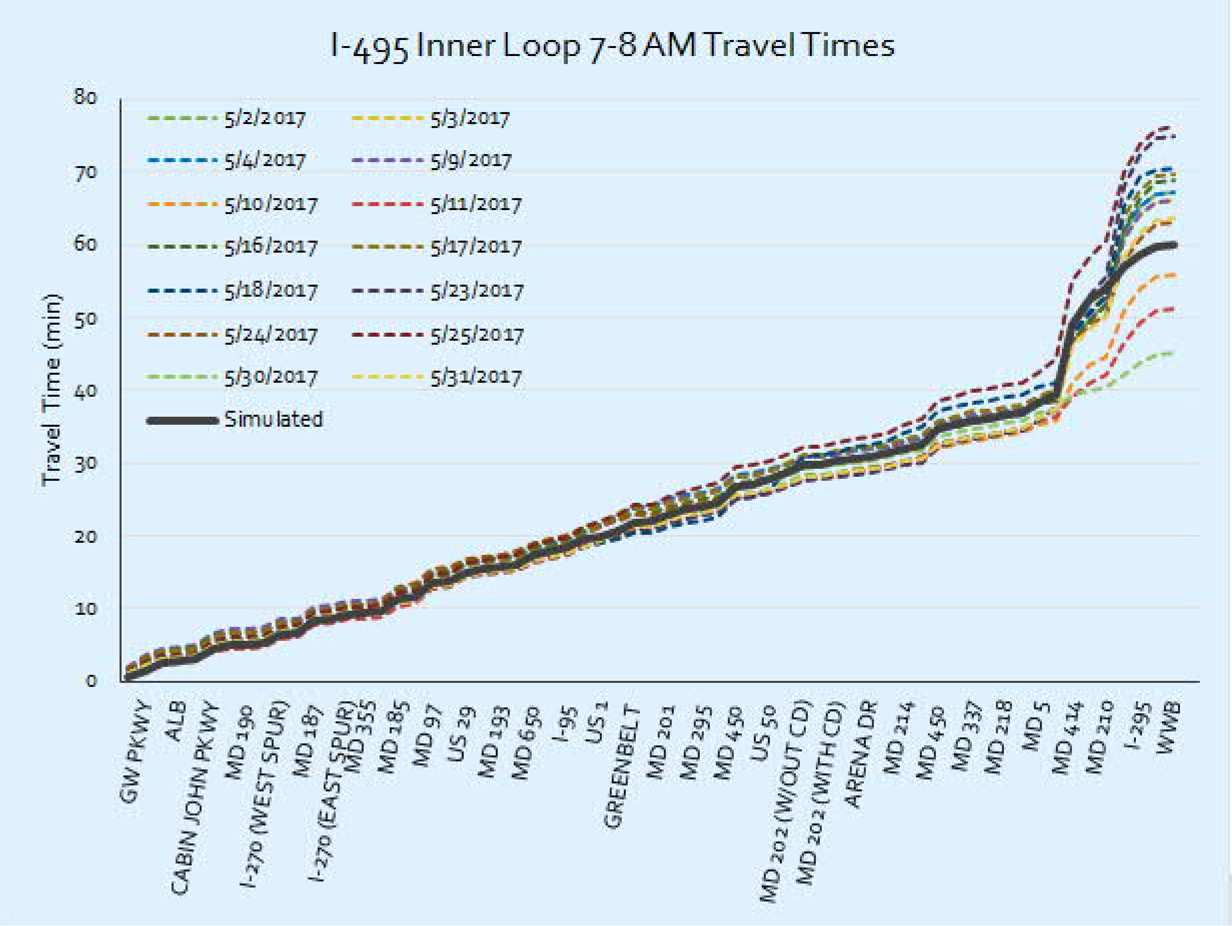


Figure B.18: I-495 Inner Loop – 8-9 AM VISSIM Model and May 2017 Travel Time Comparison

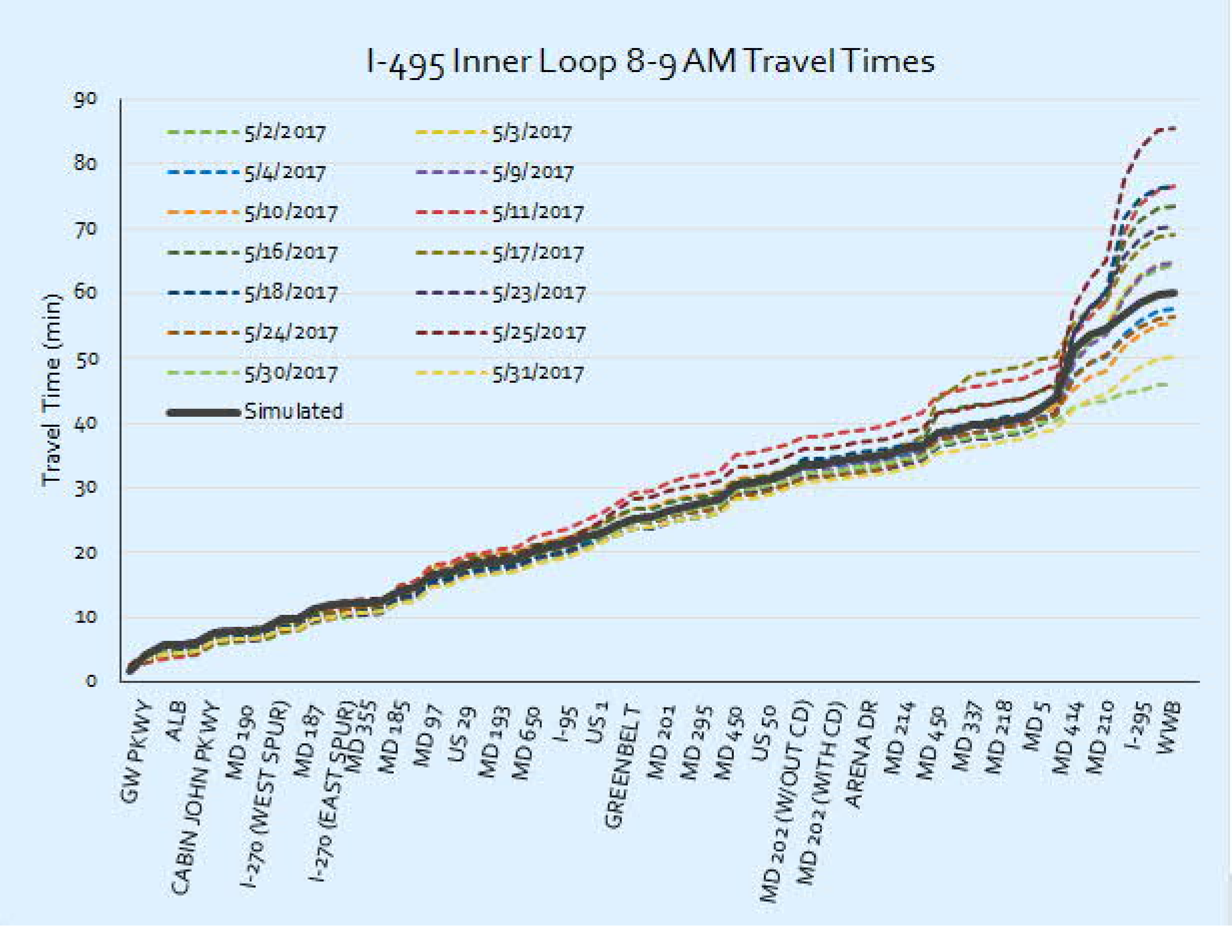


Figure B.19: I-495 Inner Loop – 4-5 PM VISSIM Model and May 2017 Travel Time Comparison

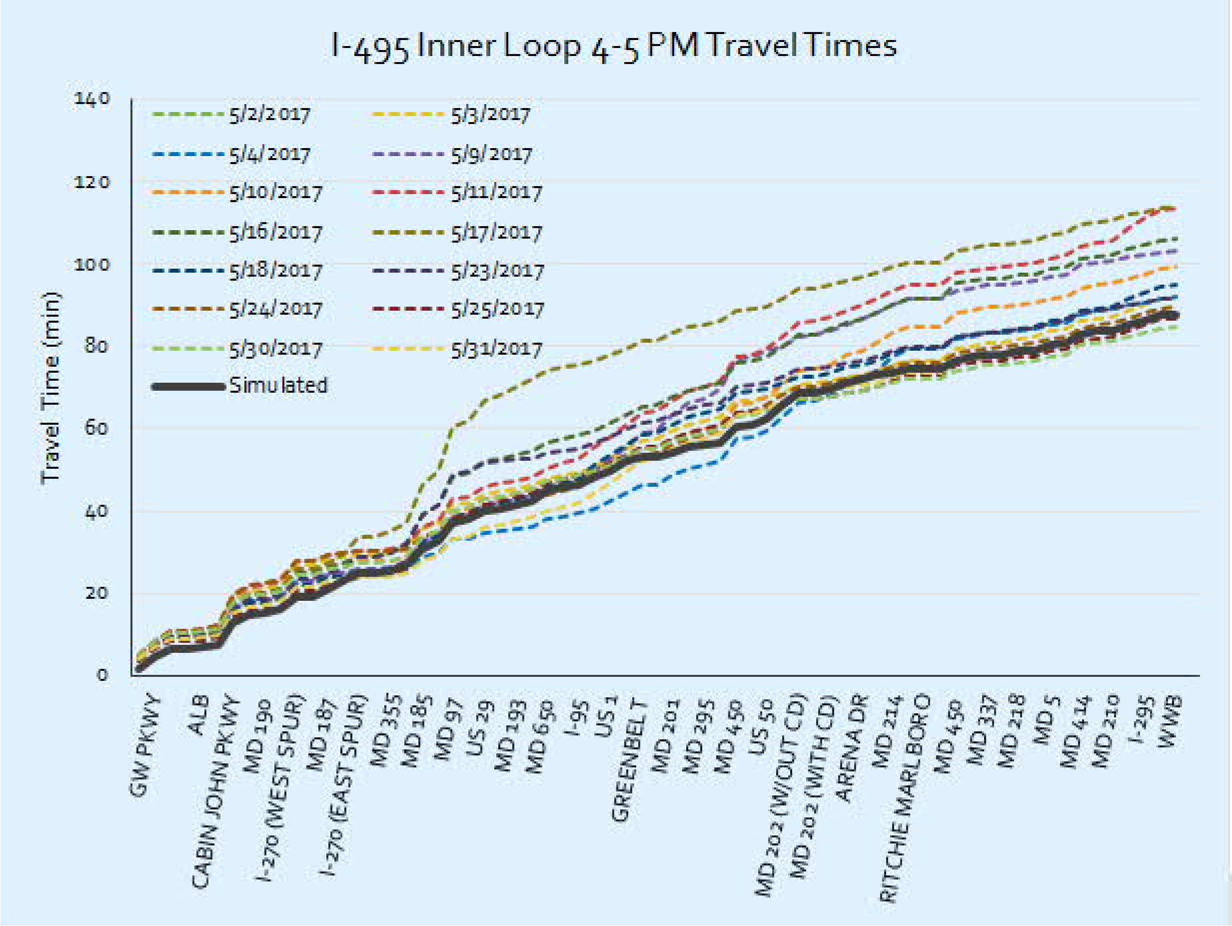


Figure B.20: I-495 Inner Loop – 5-6 PM VISSIM Model and May 2017 Travel Time Comparison

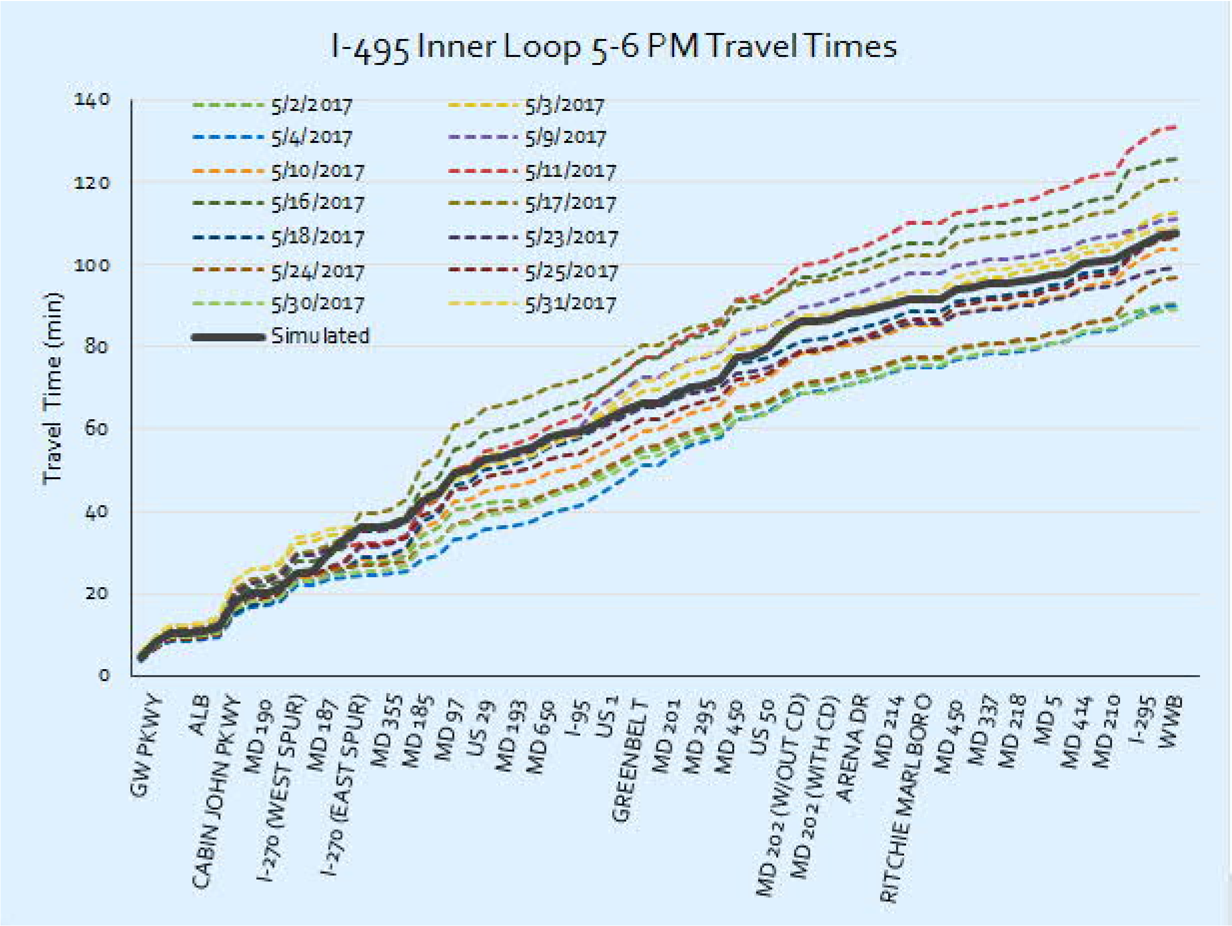


Figure B.21: I-495 Outer Loop – 7-8 AM VISSIM Model and May 2017 Travel Time Comparison

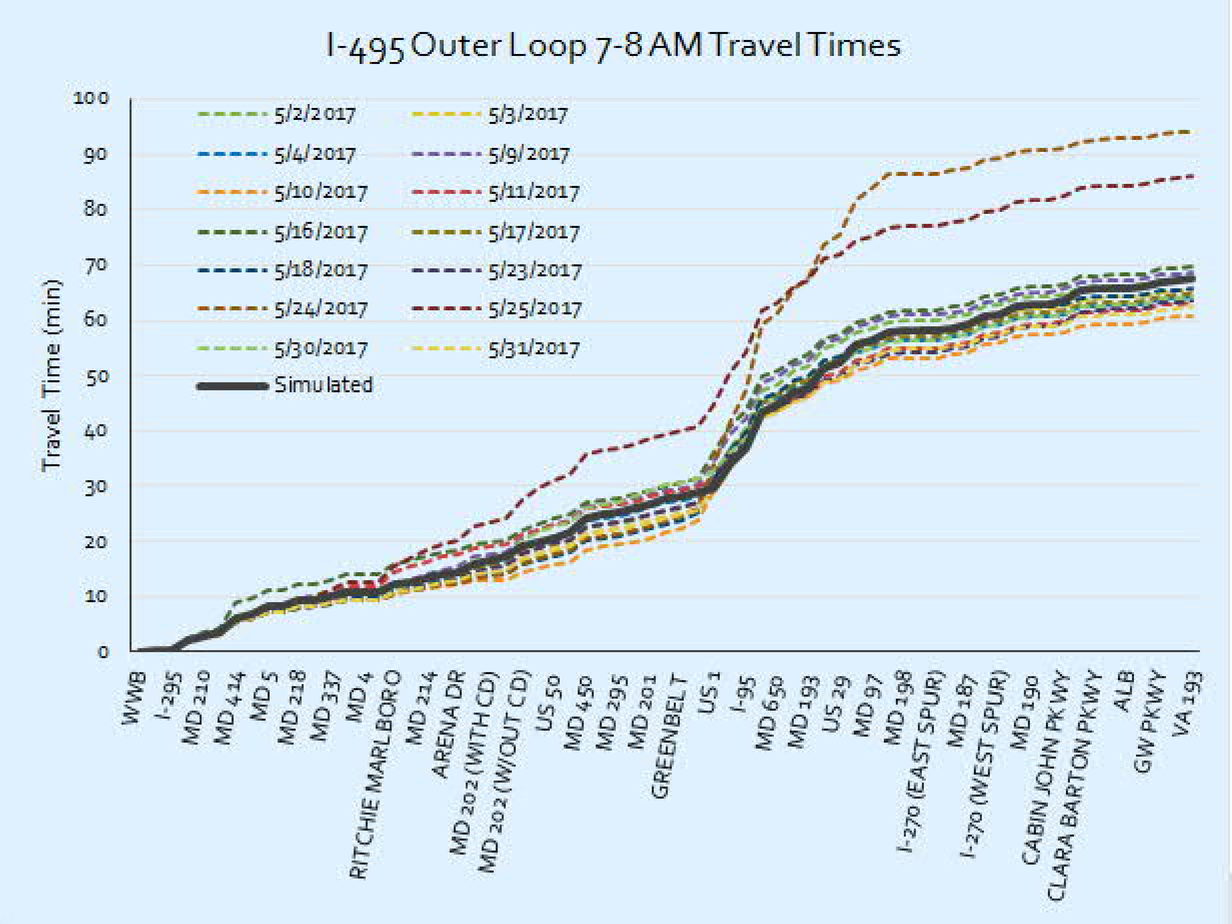


Figure B.22: I-495 Outer Loop – 8-9 AM VISSIM Model and May 2017 Travel Time Comparison

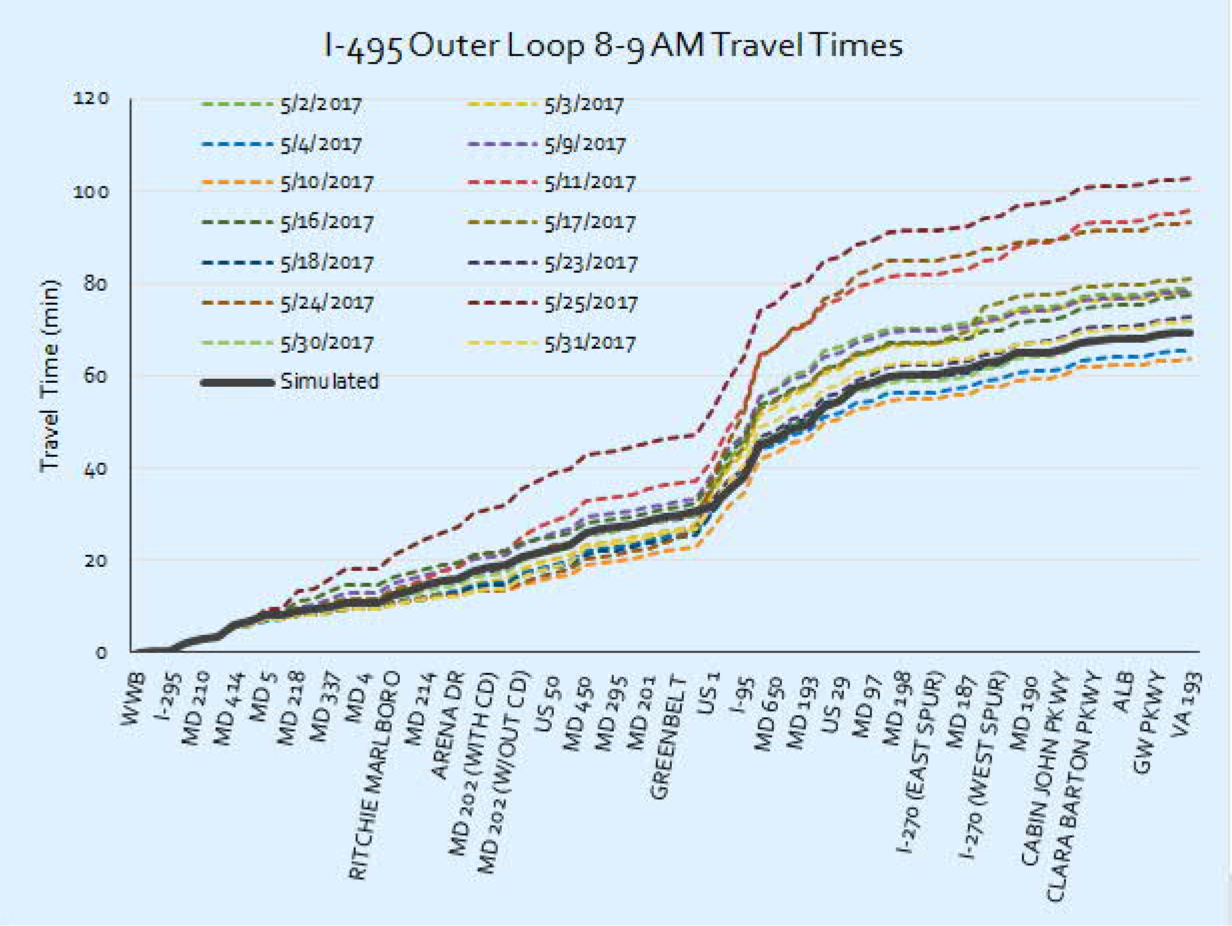


Figure B.23: I-495 Outer Loop – 4-5 PM VISSIM Model and May 2017 Travel Time Comparison

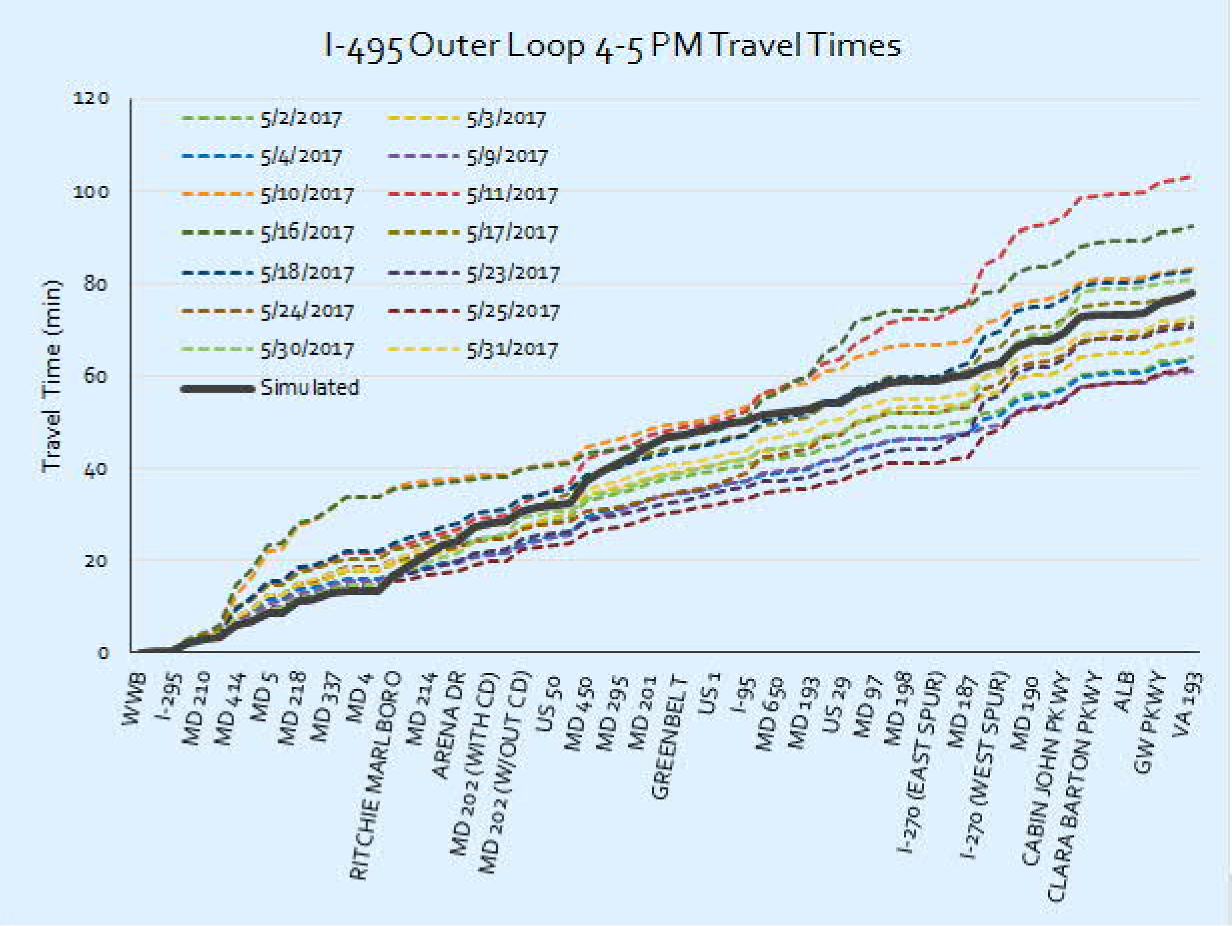


Figure B.24: I-495 Outer Loop – 5-6 PM VISSIM Model and May 2017 Travel Time Comparison

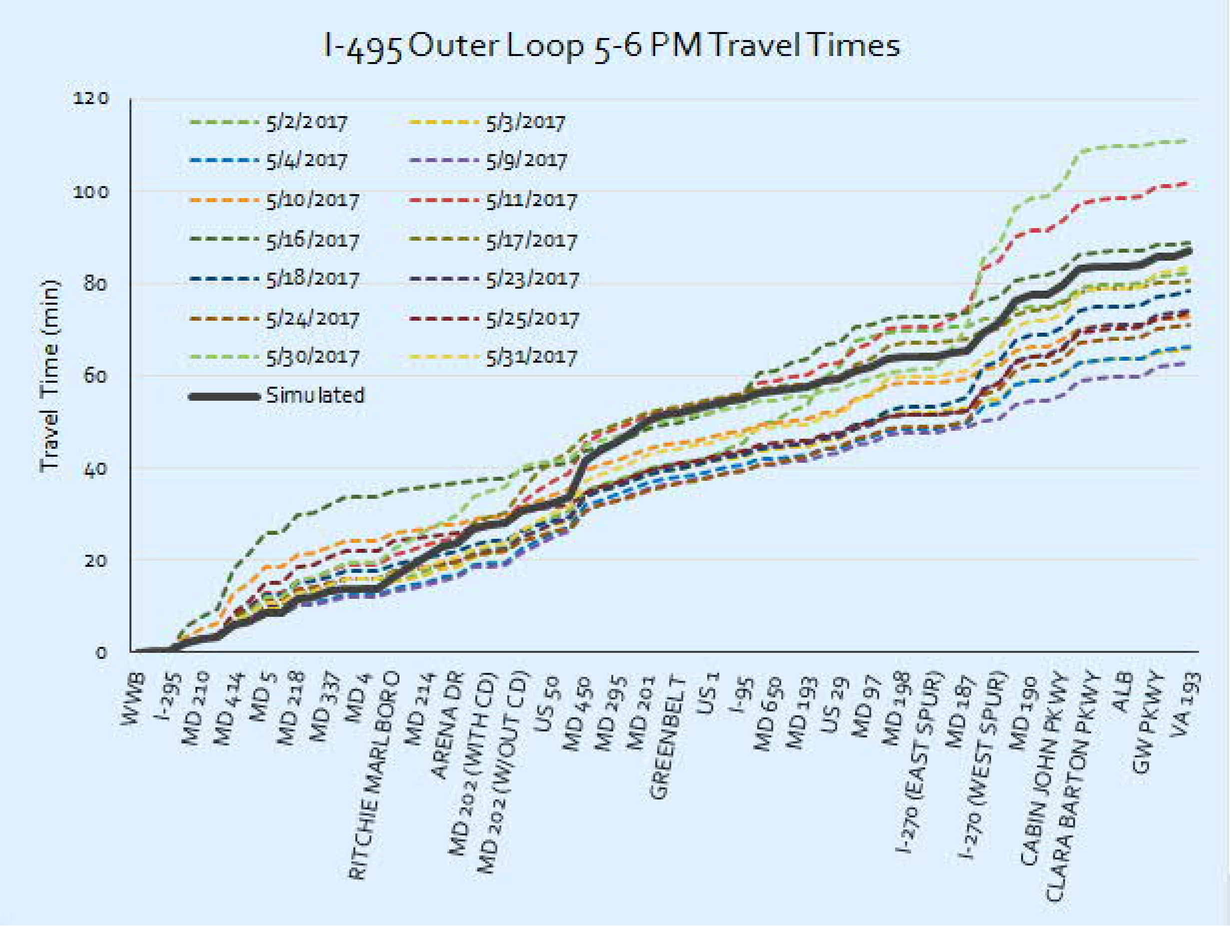


Figure B.25: I-270 Southbound – 7-8 AM VISSIM Model and May 2017 Travel Time Comparison

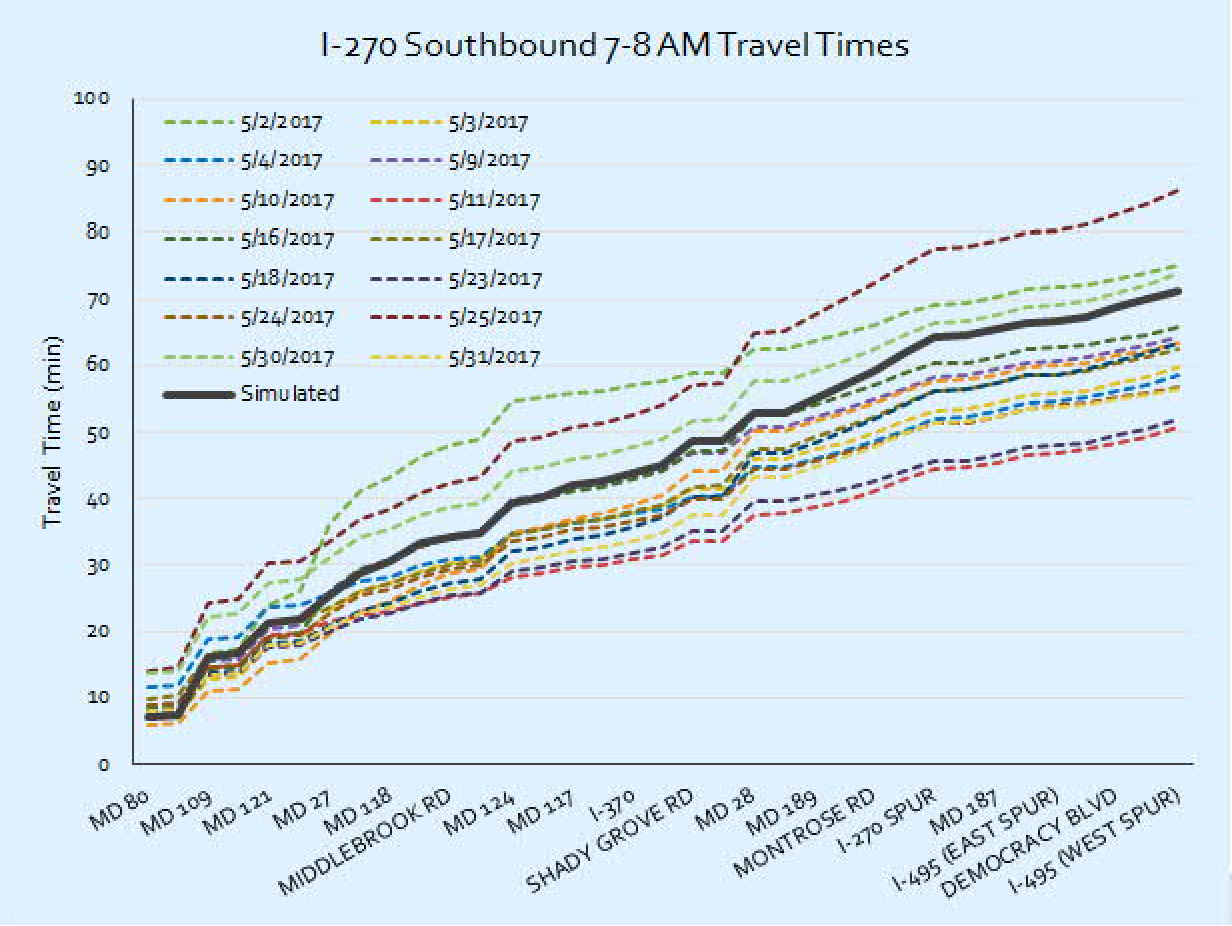


Figure B.26: I-270 Southbound – 8-9 AM VISSIM Model and May 2017 Travel Time Comparison

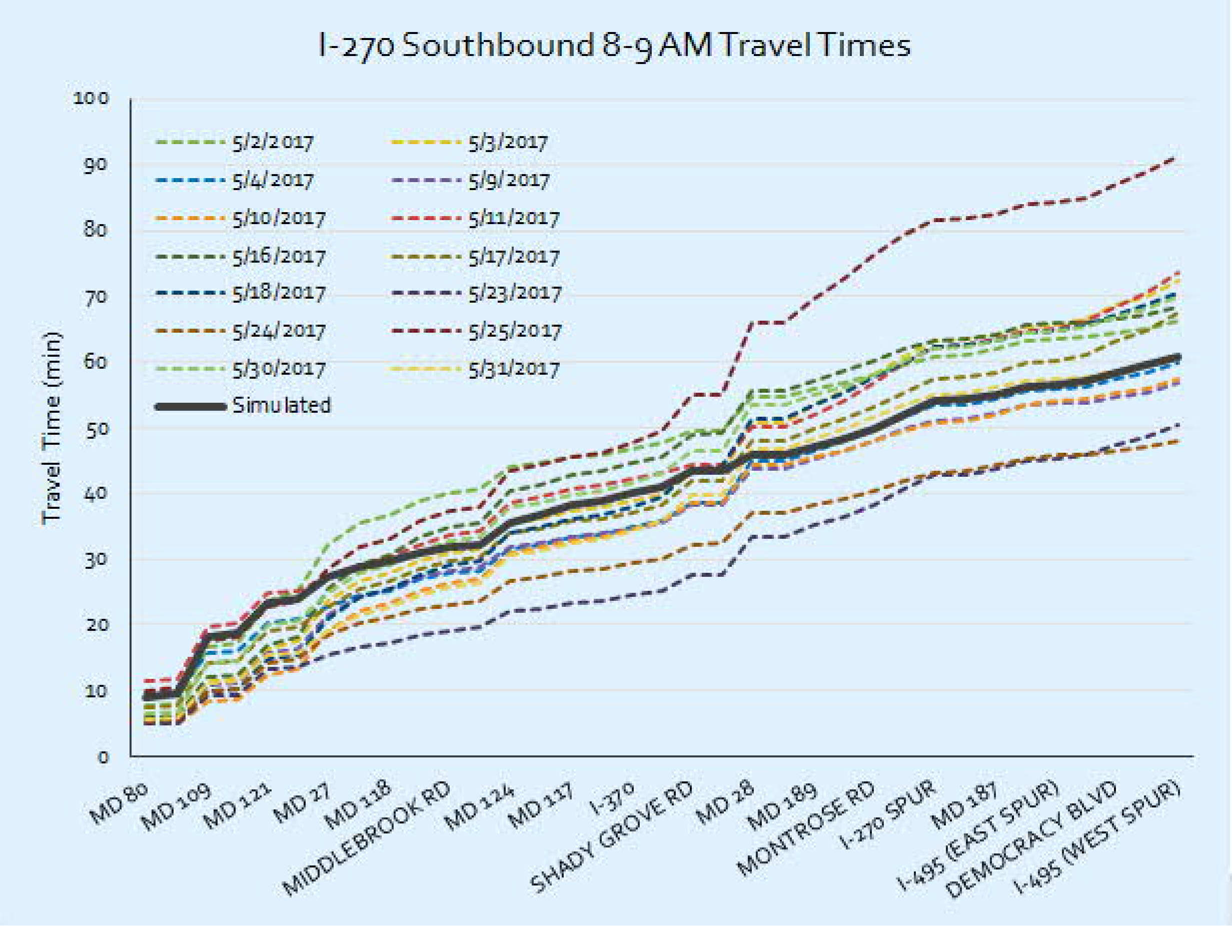


Figure B.27: I-270 Southbound – 4-5 PM VISSIM Model and May 2017 Travel Time Comparison

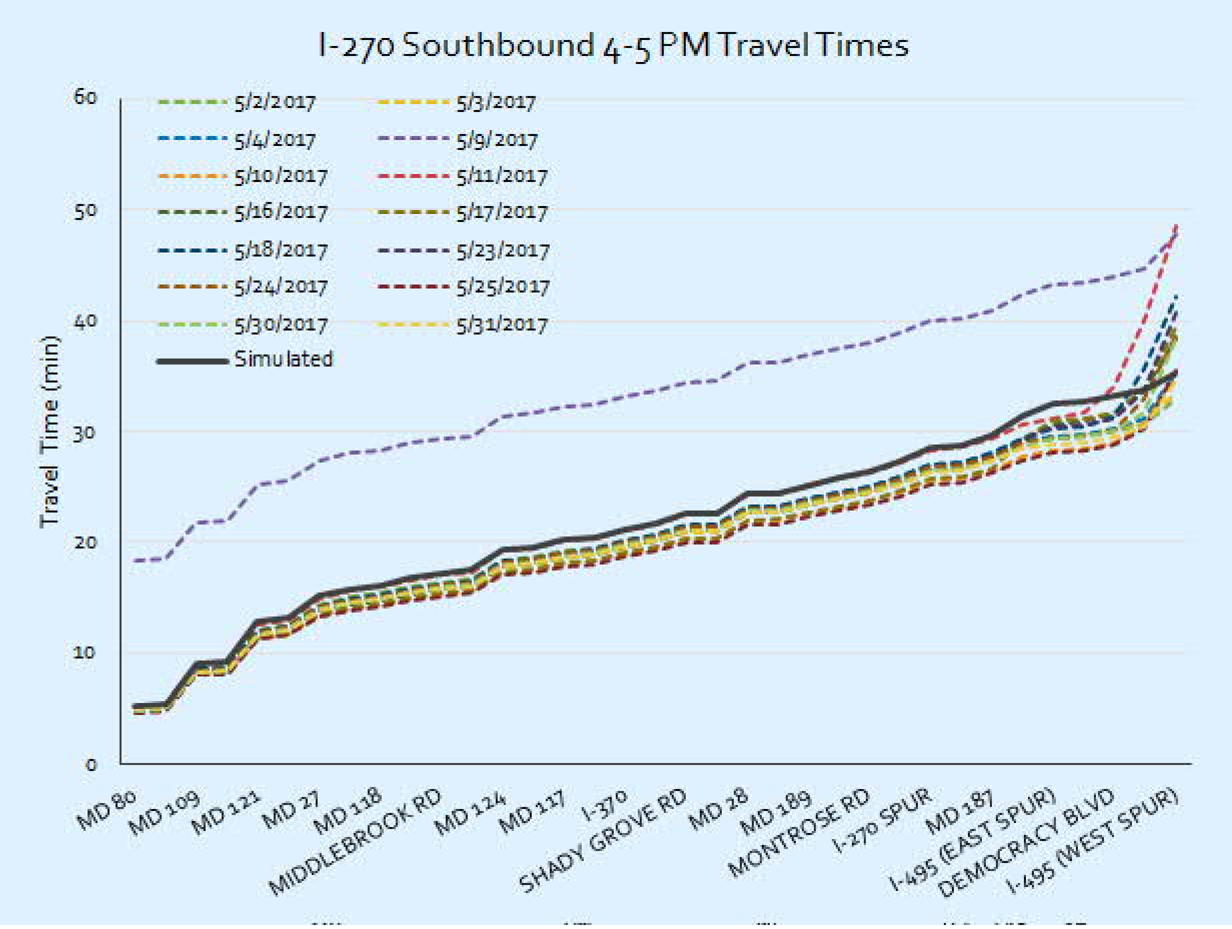


Figure B.28: I-270 Southbound – 5-6 PM VISSIM Model and May 2017 Travel Time Comparison

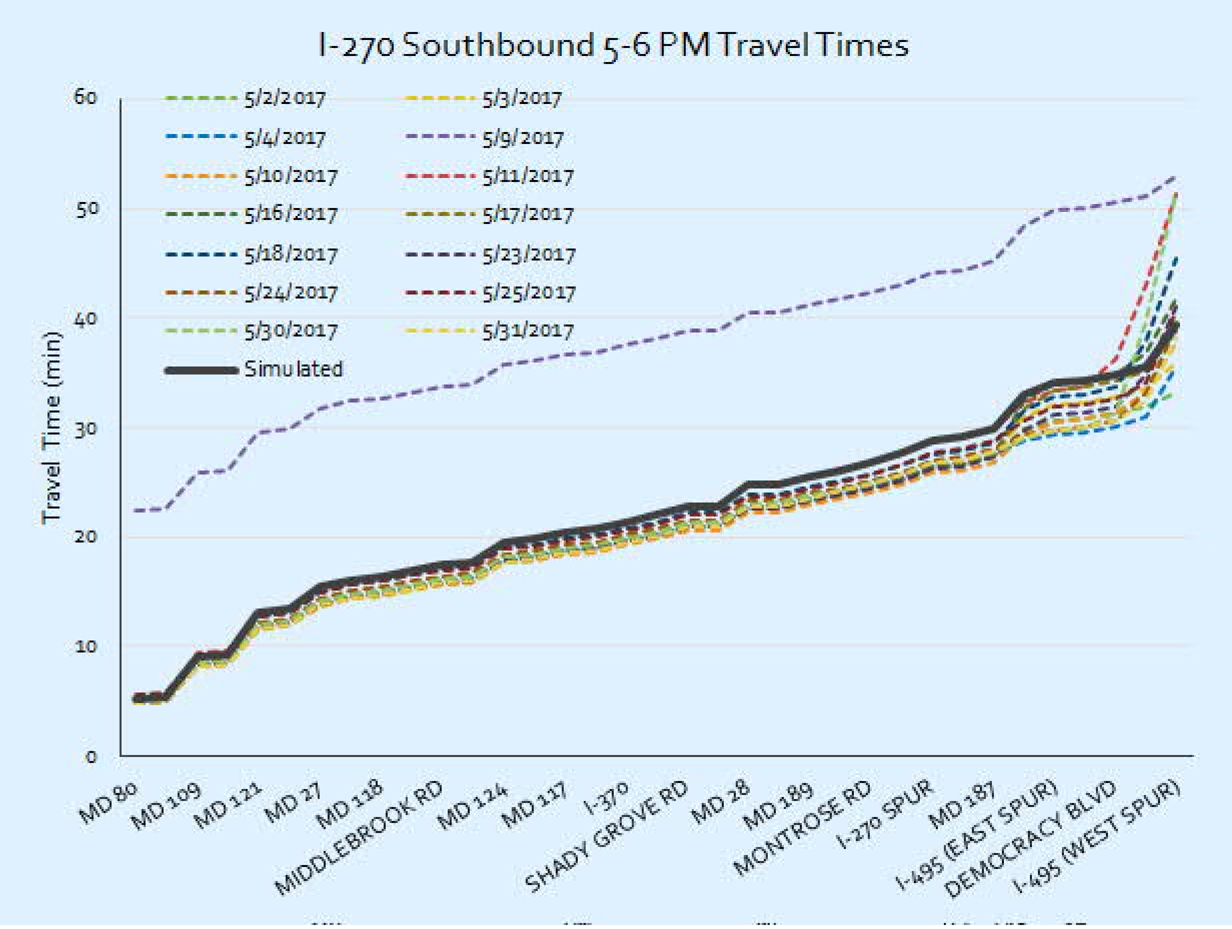


Figure B.29: I-270 Northbound – 7-8 AM VISSIM Model and May 2017 Travel Time Comparison

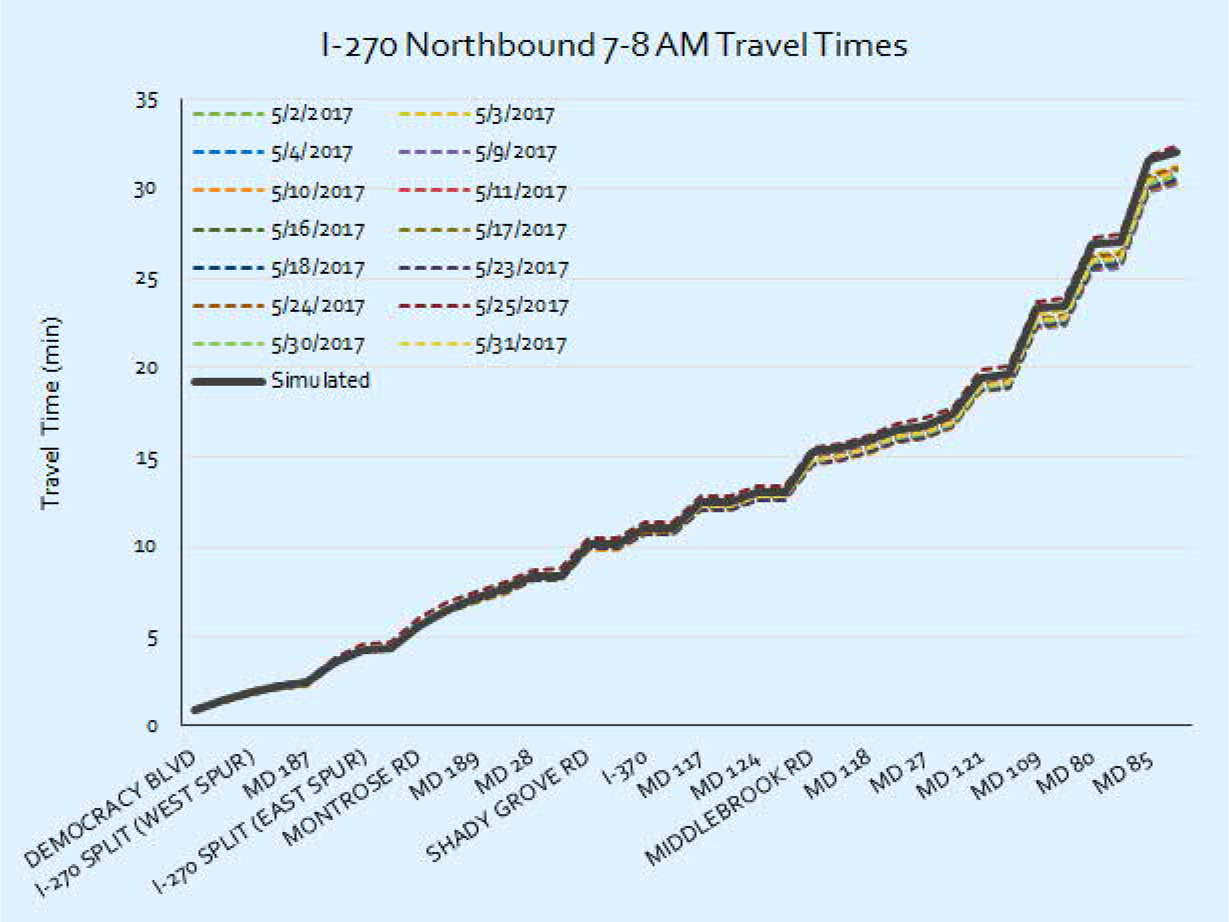


Figure B.30: I-270 Northbound – 8-9 AM VISSIM Model and May 2017 Travel Time Comparison

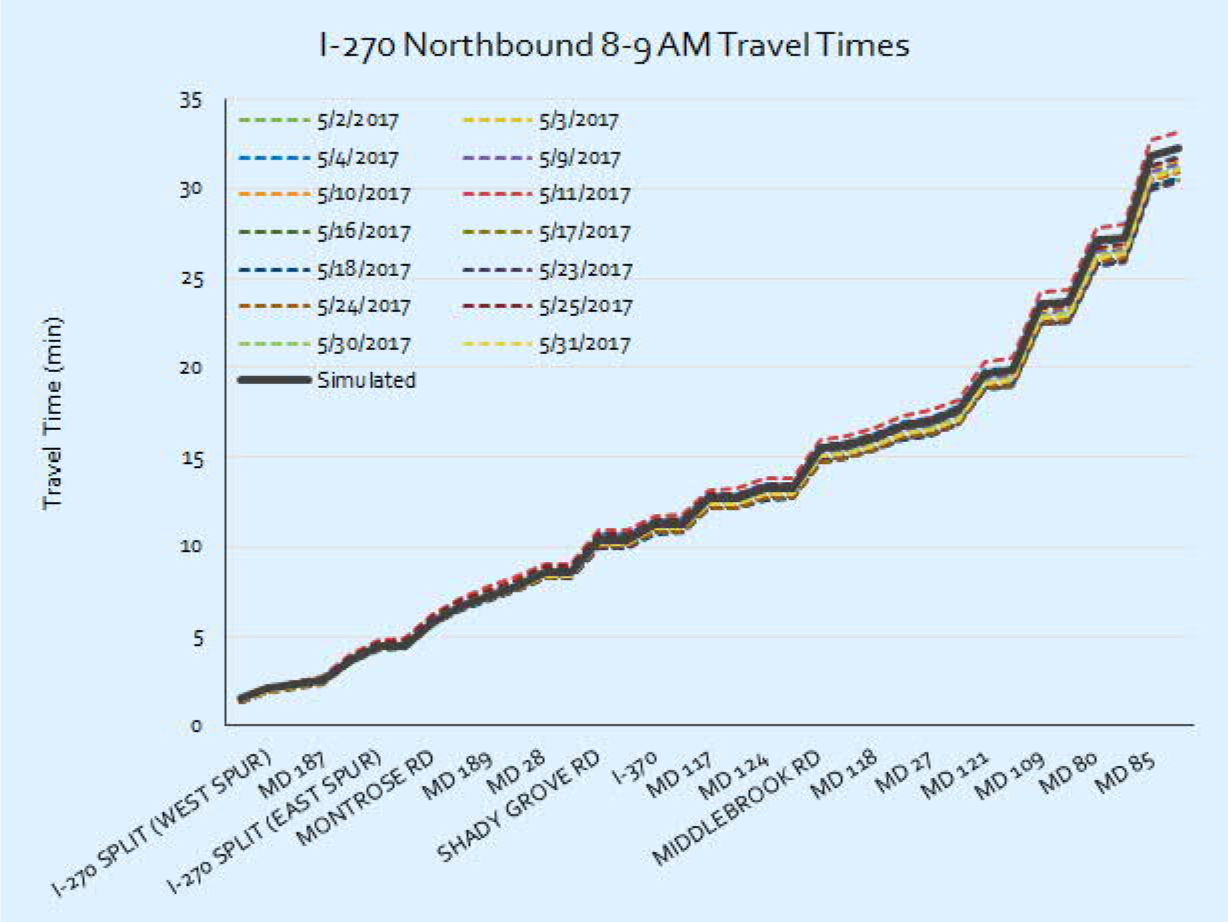


Figure B.31: I-270 Northbound – 4-5 PM Peak Hour VISSIM Model and May 2017 Travel Time Comparison

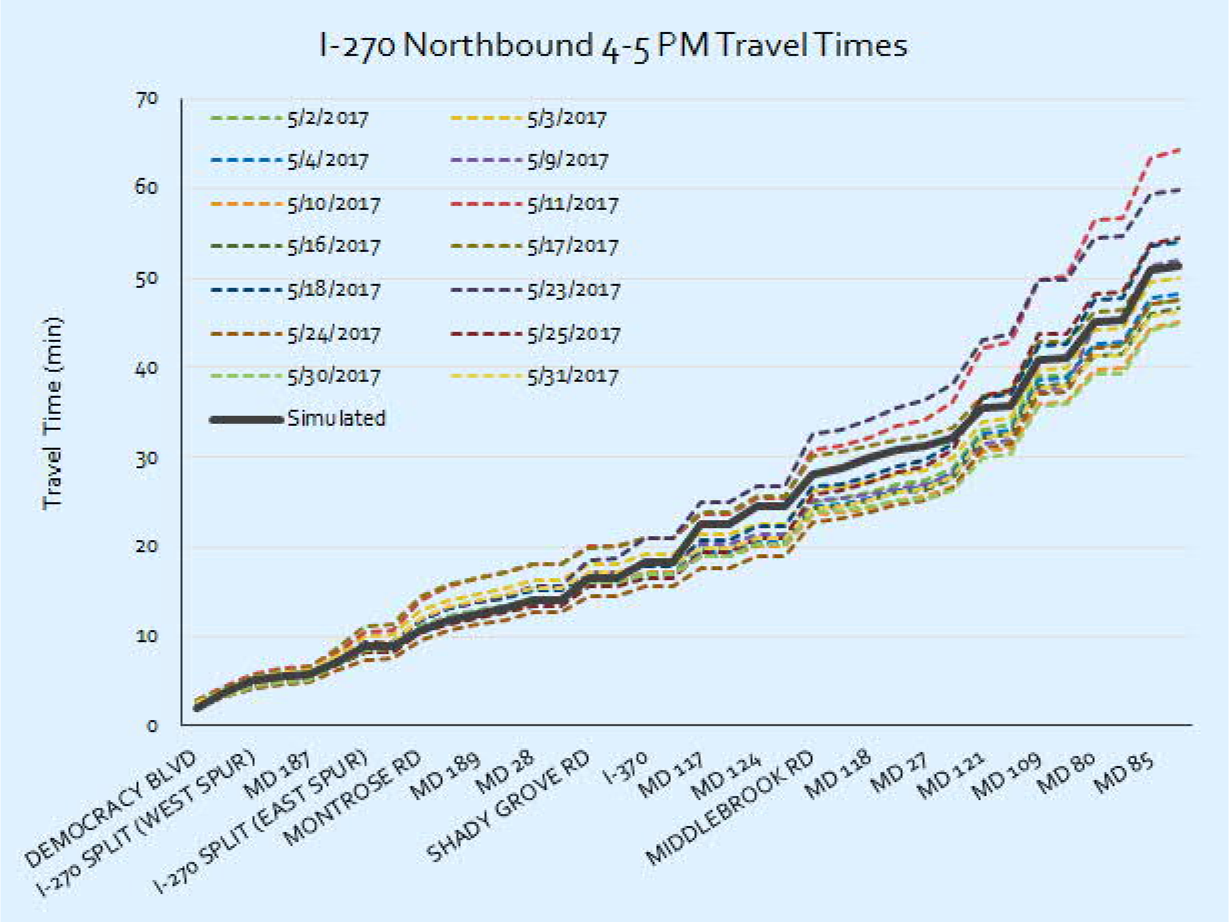
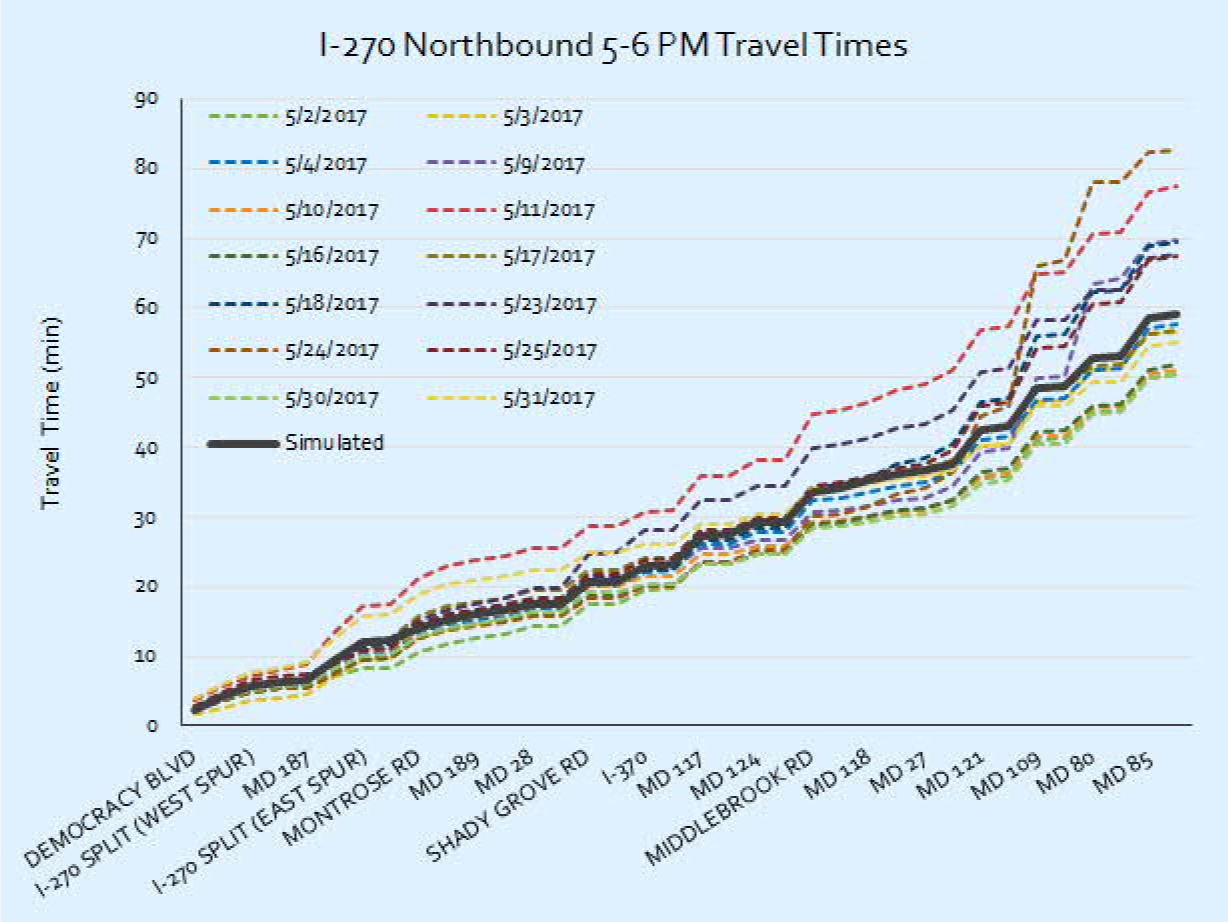


Figure B.32: I-270 Northbound – 5-6 PM VISSIM Model and May 2017 Travel Time Comparison

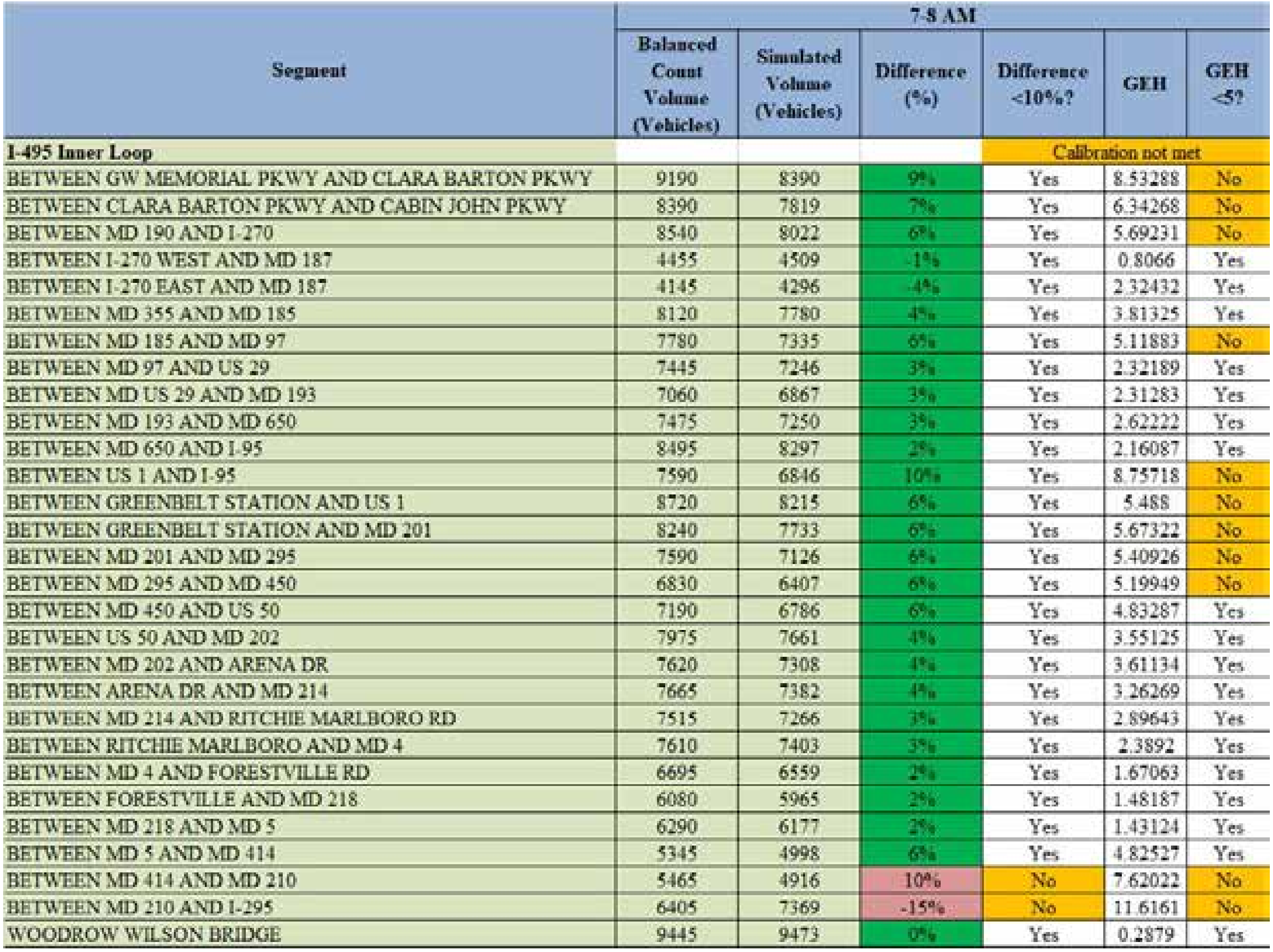


APPENDIX C

Volume Tables

Legend	
🟩	Model throughput within 10% of balanced count volume
🟥	Model throughput NOT within 10% of balanced count volume
🟨	Criteria Not Met

Figure C.1: I-495 Inner Loop 7-8 AM Volumes



Segment	7-8 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Inner Loop				Calibration not met		
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	9190	8390	9%	Yes	8.53288	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	8390	7819	7%	Yes	6.34268	No
BETWEEN MD 190 AND I-270	8540	8022	6%	Yes	5.69231	No
BETWEEN I-270 WEST AND MD 187	4455	4509	-1%	Yes	0.8066	Yes
BETWEEN I-270 EAST AND MD 187	4145	4296	-4%	Yes	2.32432	Yes
BETWEEN MD 355 AND MD 185	8120	7780	4%	Yes	3.81325	Yes
BETWEEN MD 185 AND MD 97	7780	7335	6%	Yes	5.11883	No
BETWEEN MD 97 AND US 29	7445	7246	3%	Yes	2.32189	Yes
BETWEEN MD US 29 AND MD 193	7060	6867	3%	Yes	2.31283	Yes
BETWEEN MD 193 AND MD 650	7475	7250	3%	Yes	2.62222	Yes
BETWEEN MD 650 AND I-95	8495	8297	2%	Yes	2.16087	Yes
BETWEEN US 1 AND I-95	7590	6846	10%	Yes	8.75718	No
BETWEEN GREENBELT STATION AND US 1	8720	8215	6%	Yes	5.488	No
BETWEEN GREENBELT STATION AND MD 201	8240	7733	6%	Yes	5.67322	No
BETWEEN MD 201 AND MD 295	7590	7126	6%	Yes	5.40926	No
BETWEEN MD 295 AND MD 450	6830	6407	6%	Yes	5.19949	No
BETWEEN MD 450 AND US 50	7190	6786	6%	Yes	4.83287	Yes
BETWEEN US 50 AND MD 202	7975	7661	4%	Yes	3.55125	Yes
BETWEEN MD 202 AND ARENA DR	7620	7308	4%	Yes	3.61134	Yes
BETWEEN ARENA DR AND MD 214	7665	7382	4%	Yes	3.26269	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7515	7266	3%	Yes	2.89643	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7610	7403	3%	Yes	2.3892	Yes
BETWEEN MD 4 AND FORESTVILLE RD	6695	6559	2%	Yes	1.67063	Yes
BETWEEN FORESTVILLE AND MD 218	6080	5965	2%	Yes	1.48187	Yes
BETWEEN MD 218 AND MD 5	6290	6177	2%	Yes	1.43124	Yes
BETWEEN MD 5 AND MD 414	5345	4998	6%	Yes	4.82527	Yes
BETWEEN MD 414 AND MD 210	5465	4916	10%	No	7.62022	No
BETWEEN MD 210 AND I-295	6405	7369	-15%	No	11.6161	No
WOODROW WILSON BRIDGE	9445	9473	0%	Yes	0.2879	Yes

Figure C.2: I-495 Inner Loop 8-9 AM Volumes

Segment	8-9 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Inner Loop				Calibrated		
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	9175	8317	9%	Yes	9.1745	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	8430	7716	8%	Yes	7.94659	No
BETWEEN MD 190 AND I-270	8990	8306	8%	Yes	7.35526	No
BETWEEN I-270 WEST AND MD 187	4090	3930	4%	Yes	2.52667	Yes
BETWEEN I-270 EAST AND MD 187	3805	3695	3%	Yes	1.79629	Yes
BETWEEN MD 355 AND MD 185	7435	7271	2%	Yes	1.91254	Yes
BETWEEN MD 185 AND MD 97	7550	7475	1%	Yes	0.8653	Yes
BETWEEN MD 97 AND US 29	7250	7250	0%	Yes	0	Yes
BETWEEN MD US 29 AND MD 193	6965	6972	0%	Yes	0.08385	Yes
BETWEEN MD 193 AND MD 650	7465	7467	0%	Yes	0.02315	Yes
BETWEEN MD 650 AND I-95	7905	7881	0%	Yes	0.27014	Yes
BETWEEN US 1 AND I-95	7215	7455	-3%	Yes	2.80228	Yes
BETWEEN GREENBELT STATION AND US 1	8460	8532	-1%	Yes	0.78113	Yes
BETWEEN GREENBELT STATION AND MD 201	8085	8094	0%	Yes	0.10006	Yes
BETWEEN MD 201 AND MD 295	7860	7876	0%	Yes	0.18038	Yes
BETWEEN MD 295 AND MD 450	7245	7230	0%	Yes	0.17632	Yes
BETWEEN MD 450 AND US 50	7890	7629	3%	Yes	2.96295	Yes
BETWEEN US 50 AND MD 202	8610	8378	3%	Yes	2.51728	Yes
BETWEEN MD 202 AND ARENA DR	8205	7977	3%	Yes	2.53474	Yes
BETWEEN ARENA DR AND MD 214	8045	7800	3%	Yes	2.75255	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7560	7358	3%	Yes	2.3389	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7540	7221	4%	Yes	3.7132	Yes
BETWEEN MD 4 AND FORESTVILLE RD	7290	7003	4%	Yes	3.39496	Yes
BETWEEN FORESTVILLE AND MD 218	6635	6373	4%	Yes	3.24871	Yes
BETWEEN MD 218 AND MD 5	6885	6613	4%	Yes	3.31092	Yes
BETWEEN MD 5 AND MD 414	6050	6072	0%	Yes	0.28259	Yes
BETWEEN MD 414 AND MD 210	6035	6079	-1%	Yes	0.56536	Yes
BETWEEN MD 210 AND I-295	6715	7973	-19%	No	14.6796	No
WOODROW WILSON BRIDGE	9280	9637	-4%	Yes	3.67077	Yes

Figure C.3: I-495 Inner Loop 4-5 PM Volumes

Segment	4-5 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Inner Loop				Calibrated		
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	7810	7938	-2%	Yes	1.44249	Yes
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	6845	6969	-2%	Yes	1.49203	Yes
BETWEEN MD 190 AND I-270	8905	8744	2%	Yes	1.71388	Yes
BETWEEN I-270 WEST AND MD 187	3770	3892	-3%	Yes	1.97108	Yes
BETWEEN I-270 EAST AND MD 187	3645	3541	3%	Yes	1.73502	Yes
BETWEEN MD 355 AND MD 185	7440	7024	6%	Yes	4.89175	Yes
BETWEEN MD 185 AND MD 97	8355	8096	3%	Yes	2.85574	Yes
BETWEEN MD 97 AND US 29	8665	8394	3%	Yes	2.93432	Yes
BETWEEN MD US 29 AND MD 193	8385	8027	4%	Yes	3.952	Yes
BETWEEN MD 193 AND MD 650	8505	8231	3%	Yes	2.9953	Yes
BETWEEN MD 650 AND I-95	9115	8909	2%	Yes	2.16998	Yes
BETWEEN US 1 AND I-95	7170	6851	4%	Yes	3.80992	Yes
BETWEEN GREENBELT STATION AND US 1	8115	8272	-2%	Yes	1.73446	Yes
BETWEEN GREENBELT STATION AND MD 201	7990	8163	-2%	Yes	1.92502	Yes
BETWEEN MD 201 AND MD 295	8020	8028	0%	Yes	0.08931	Yes
BETWEEN MD 295 AND MD 450	7850	7641	3%	Yes	2.37477	Yes
BETWEEN MD 450 AND US 50	8240	8118	1%	Yes	1.34899	Yes
BETWEEN US 50 AND MD 202	8095	7971	2%	Yes	1.38351	Yes
BETWEEN MD 202 AND ARENA DR	7490	7741	-3%	Yes	2.87624	Yes
BETWEEN ARENA DR AND MD 214	7265	7617	-5%	Yes	4.08063	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7195	7498	-4%	Yes	3.53511	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	6885	7008	-2%	Yes	1.47578	Yes
BETWEEN MD 4 AND FORESTVILLE RD	6680	6919	-4%	Yes	2.89841	Yes
BETWEEN FORESTVILLE AND MD 218	6185	6446	-4%	Yes	3.28425	Yes
BETWEEN MD 218 AND MD 5	6830	7104	-4%	Yes	3.28267	Yes
BETWEEN MD 5 AND MD 414	5710	5831	-2%	Yes	1.59286	Yes
BETWEEN MD 414 AND MD 210	5455	5558	-2%	Yes	1.38803	Yes
BETWEEN MD 210 AND I-295	5740	6024	-5%	Yes	3.70302	Yes
WOODROW WILSON BRIDGE	8415	8661	-3%	Yes	2.6623	Yes

Figure C.4: I-495 Inner Loop 5-6 PM Volumes

Segment	**5-6 PM**					
	Balanced Count Volume (Vehicles)	**Simulated Volume (Vehicles)**	**Difference (%)**	**Difference <10%?**	**GEH**	**GEH <5?**
I-495 Inner Loop				Calibrated		
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	8085	7612	6%	Yes	5.3391	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	6820	6608	3%	Yes	2.58729	Yes
BETWEEN MD 190 AND I-270	8515	8308	2%	Yes	2.25701	Yes
BETWEEN I-270 WEST AND MD 187	3575	3449	4%	Yes	2.12615	Yes
BETWEEN I-270 EAST AND MD 187	3445	3274	5%	Yes	2.95025	Yes
BETWEEN MD 355 AND MD 185	7055	6945	2%	Yes	1.31475	Yes
BETWEEN MD 185 AND MD 97	7820	7896	-1%	Yes	0.85735	Yes
BETWEEN MD 97 AND US 29	7975	8084	-1%	Yes	1.21642	Yes
BETWEEN MD US 29 AND MD 193	7695	7765	-1%	Yes	0.79617	Yes
BETWEEN MD 193 AND MD 650	7765	8000	-3%	Yes	2.64689	Yes
BETWEEN MD 650 AND I-95	8500	8504	0%	Yes	0.04338	Yes
BETWEEN US 1 AND I-95	6745	6658	1%	Yes	1.06276	Yes
BETWEEN GREENBELT STATION AND US 1	7745	7976	-3%	Yes	2.60547	Yes
BETWEEN GREENBELT STATION AND MD 201	7640	7713	-1%	Yes	0.83318	Yes
BETWEEN MD 201 AND MD 295	7630	7631	0%	Yes	0.01145	Yes
BETWEEN MD 295 AND MD 450	7360	7139	3%	Yes	2.5956	Yes
BETWEEN MD 450 AND US 50	7810	7778	0%	Yes	0.36247	Yes
BETWEEN US 50 AND MD 202	8245	8102	2%	Yes	1.58173	Yes
BETWEEN MD 202 AND ARENA DR	7845	7966	-2%	Yes	1.36088	Yes
BETWEEN ARENA DR AND MD 214	7510	7717	-3%	Yes	2.37235	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7410	7679	-4%	Yes	3.09697	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7300	7376	-1%	Yes	0.88721	Yes
BETWEEN MD 4 AND FORESTVILLE RD	6870	7057	-3%	Yes	2.24093	Yes
BETWEEN FORESTVILLE AND MD 218	6405	6646	-4%	Yes	2.98339	Yes
BETWEEN MD 218 AND MD 5	6965	7213	-4%	Yes	2.9455	Yes
BETWEEN MD 5 AND MD 414	5880	6034	-3%	Yes	1.99529	Yes
BETWEEN MD 414 AND MD 210	5635	5758	-2%	Yes	1.62968	Yes
BETWEEN MD 210 AND I-295	5785	6123	-6%	Yes	4.38039	Yes
WOODROW WILSON BRIDGE	8315	8861	-7%	Yes	5.89178	No

Figure C.5: I-495 Outer Loop 7-8 AM Volumes

Segment	7-8 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Outer Loop					Calibrated	
WOODROW WILSON BRIDGE	8625	8105	6%	Yes	5.68552	No
BETWEEN MD 210 AND I-295	5170	4844	6%	Yes	4.60711	Yes
BETWEEN MD 414 AND MD 210	5290	5005	5%	Yes	3.97234	Yes
BETWEEN MD 5 AND MD 414	5405	5063	6%	Yes	4.72726	Yes
BETWEEN MD 218 AND MD 5	6520	6364	2%	Yes	1.94363	Yes
BETWEEN FORESTVILLE AND MD 218	5785	5657	2%	Yes	1.69229	Yes
BETWEEN MD 4 AND FORESTVILLE RD	6840	6705	2%	Yes	1.64044	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7400	7401	0%	Yes	0.01162	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	8080	8342	-3%	Yes	2.89137	Yes
BETWEEN ARENA DR AND MD 214	8040	8286	-3%	Yes	2.72277	Yes
BETWEEN MD 202 AND ARENA DR	7785	8097	-4%	Yes	3.5012	Yes
BETWEEN US 50 AND MD 202	7855	7744	1%	Yes	1.25687	Yes
BETWEEN MD 450 AND US 50	8180	8364	-2%	Yes	2.02308	Yes
BETWEEN MD 295 AND MD 450	8205	8403	-2%	Yes	2.17281	Yes
BETWEEN MD 201 AND MD 295	8280	8537	-3%	Yes	2.80268	Yes
BETWEEN GREENBELT STATION AND MD 201	7410	7778	-5%	Yes	4.22292	Yes
BETWEEN GREENBELT STATION AND US 1	7465	7835	-5%	Yes	4.2303	Yes
BETWEEN US 1 AND I-95	7010	7524	-7%	Yes	6.02956	No
BETWEEN MD 650 AND I-95	6540	6471	1%	Yes	0.85548	Yes
BETWEEN MD 193 AND MD 650	5735	6108	-7%	Yes	4.84722	Yes
BETWEEN MD US 29 AND MD 193	6020	6450	-7%	Yes	5.44566	No
BETWEEN MD 97 AND US 29	7100	7053	1%	Yes	0.55871	Yes
BETWEEN MD 185 AND MD 97	8225	8202	0%	Yes	0.25378	Yes
BETWEEN MD 355 AND MD 185	7745	7704	1%	Yes	0.4665	Yes
BETWEEN I-270 EAST AND MD 187	4425	4284	3%	Yes	2.13673	Yes
BETWEEN I-270 WEST AND MD 187	4605	4604	0%	Yes	0.01474	Yes
BETWEEN MD 190 AND I-270	10180	9883	3%	Yes	2.96533	Yes
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	8565	8345	3%	Yes	2.39258	Yes
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	9115	8873	3%	Yes	2.55175	Yes

Figure C.6: I-495 Outer Loop 8-9 AM Volumes

Segment	8-9 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Outer Loop				Calibration not met		
WOODROW WILSON BRIDGE	7880	7861	0%	Yes	0.21417	Yes
BETWEEN MD 210 AND I-295	4585	4618	-1%	Yes	0.48648	Yes
BETWEEN MD 414 AND MD 210	4810	4826	0%	Yes	0.23051	Yes
BETWEEN MD 5 AND MD 414	4855	4748	2%	Yes	1.54417	Yes
BETWEEN MD 218 AND MD 5	5760	5685	1%	Yes	0.99144	Yes
BETWEEN FORESTVILLE AND MD 218	5090	5027	1%	Yes	0.88579	Yes
BETWEEN MD 4 AND FORESTVILLE RD	6095	6044	1%	Yes	0.65463	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	6825	6914	-1%	Yes	1.07381	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7535	7470	1%	Yes	0.75043	Yes
BETWEEN ARENA DR AND MD 214	7605	7573	0%	Yes	0.36733	Yes
BETWEEN MD 202 AND ARENA DR	7355	7520	-2%	Yes	1.91324	Yes
BETWEEN US 50 AND MD 202	7390	7698	-4%	Yes	3.54609	Yes
BETWEEN MD 450 AND US 50	8095	8569	-6%	Yes	5.19283	No
BETWEEN MD 295 AND MD 450	7875	8385	-6%	Yes	5.6562	No
BETWEEN MD 201 AND MD 295	7780	8252	-6%	Yes	5.27185	No
BETWEEN GREENBELT STATION AND MD 201	7050	7490	-6%	Yes	5.16043	No
BETWEEN GREENBELT STATION AND US 1	7105	7553	-6%	Yes	5.23306	No
BETWEEN US 1 AND I-95	6925	7361	-6%	Yes	5.15877	No
BETWEEN MD 650 AND I-95	6200	6722	-8%	Yes	6.49412	No
BETWEEN MD 193 AND MD 650	5340	5956	-12%	No	8.19659	No
BETWEEN MD US 29 AND MD 193	5555	6278	-13%	No	9.39952	No
BETWEEN MD 97 AND US 29	6545	6850	-5%	Yes	3.72686	Yes
BETWEEN MD 185 AND MD 97	8090	8266	-2%	Yes	1.94621	Yes
BETWEEN MD 355 AND MD 185	8235	8311	-1%	Yes	0.83557	Yes
BETWEEN I-270 EAST AND MD 187	4010	3848	4%	Yes	2.58448	Yes
BETWEEN I-270 WEST AND MD 187	4070	4073	0%	Yes	0.04702	Yes
BETWEEN MD 190 AND I-270	9130	9627	-5%	Yes	5.13204	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	7900	8260	-5%	Yes	4.00495	Yes
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	8950	9254	-3%	Yes	3.18644	Yes

Figure C.7: I-495 Outer Loop 4-5 PM Volumes

Segment	4-5 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Outer Loop				Calibration not met		
WOODROW WILSON BRIDGE	9190	9151	0%	Yes	0.40726	Yes
BETWEEN MD 210 AND I-295	7575	7543	0%	Yes	0.36806	Yes
BETWEEN MD 414 AND MD 210	7375	7304	1%	Yes	0.82875	Yes
BETWEEN MD 5 AND MD 414	6720	6714	0%	Yes	0.07321	Yes
BETWEEN MD 218 AND MD 5	6580	6703	-2%	Yes	1.50929	Yes
BETWEEN FORESTVILLE AND MD 218	6175	6234	-1%	Yes	0.74903	Yes
BETWEEN MD 4 AND FORESTVILLE RD	7235	7296	-1%	Yes	0.71564	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7665	7708	-1%	Yes	0.49046	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7725	7146	7%	Yes	6.71465	No
BETWEEN ARENA DR AND MD 214	7385	6917	6%	Yes	5.5343	No
BETWEEN MD 202 AND ARENA DR	7480	7066	6%	Yes	4.85449	Yes
BETWEEN US 50 AND MD 202	7680	7205	6%	Yes	5.50597	No
BETWEEN MD 450 AND US 50	7570	7188	5%	Yes	4.44697	Yes
BETWEEN MD 295 AND MD 450	7020	6520	7%	Yes	6.07681	No
BETWEEN MD 201 AND MD 295	8100	6933	14%	No	13.4606	No
BETWEEN GREENBELT STATION AND MD 201	8340	7313	12%	No	11.6088	No
BETWEEN GREENBELT STATION AND US 1	8655	7637	12%	No	11.2791	No
BETWEEN US 1 AND I-95	9280	8364	10%	Yes	9.75241	No
BETWEEN MD 650 AND I-95	7920	6943	12%	No	11.3333	No
BETWEEN MD 193 AND MD 650	7440	6698	10%	Yes	8.82521	No
BETWEEN MD US 29 AND MD 193	7115	6511	8%	Yes	7.31758	No
BETWEEN MD 97 AND US 29	7730	7164	7%	Yes	6.55882	No
BETWEEN MD 185 AND MD 97	7770	7371	5%	Yes	4.58575	Yes
BETWEEN MD 355 AND MD 185	7710	7521	2%	Yes	2.16577	Yes
BETWEEN I-270 EAST AND MD 187	3970	3909	2%	Yes	0.97187	Yes
BETWEEN I-270 WEST AND MD 187	4185	4121	2%	Yes	0.99311	Yes
BETWEEN MD 190 AND I-270	7780	7251	7%	Yes	6.10206	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	7295	6777	7%	Yes	6.17542	No
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	8535	8107	5%	Yes	4.69198	Yes

Figure C.8: I-495 Outer Loop 5-6 PM Volumes

Segment	5-6 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-495 Outer Loop				Calibrated		
WOODROW WILSON BRIDGE	9340	9161	2%	Yes	1.8611	Yes
BETWEEN MD 210 AND I-295	7585	7450	2%	Yes	1.55703	Yes
BETWEEN MD 414 AND MD 210	7350	7201	2%	Yes	1.74685	Yes
BETWEEN MD 5 AND MD 414	6695	6600	1%	Yes	1.16518	Yes
BETWEEN MD 218 AND MD 5	6455	6558	-2%	Yes	1.27692	Yes
BETWEEN FORESTVILLE AND MD 218	6050	6210	-3%	Yes	2.04357	Yes
BETWEEN MD 4 AND FORESTVILLE RD	7010	7331	-5%	Yes	3.7908	Yes
BETWEEN RITCHIE MARLBORO AND MD 4	7325	7681	-5%	Yes	4.10991	Yes
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7325	7491	-2%	Yes	1.92867	Yes
BETWEEN ARENA DR AND MD 214	6765	7060	-4%	Yes	3.54817	Yes
BETWEEN MD 202 AND ARENA DR	6795	7096	-4%	Yes	3.61173	Yes
BETWEEN US 50 AND MD 202	6845	7106	-4%	Yes	3.12502	Yes
BETWEEN MD 450 AND US 50	6760	6720	1%	Yes	0.48723	Yes
BETWEEN MD 295 AND MD 450	6205	6143	1%	Yes	0.78906	Yes
BETWEEN MD 201 AND MD 295	7070	6756	4%	Yes	3.77656	Yes
BETWEEN GREENBELT STATION AND MD 201	7450	7164	4%	Yes	3.34577	Yes
BETWEEN GREENBELT STATION AND US 1	7985	7661	4%	Yes	3.66318	Yes
BETWEEN US 1 AND I-95	8835	8499	4%	Yes	3.60915	Yes
BETWEEN MD 650 AND I-95	8165	7713	6%	Yes	5.07289	No
BETWEEN MD 193 AND MD 650	7765	7357	5%	Yes	4.69214	Yes
BETWEEN MD US 29 AND MD 193	7245	6879	5%	Yes	4.35529	Yes
BETWEEN MD 97 AND US 29	7980	7627	4%	Yes	3.99604	Yes
BETWEEN MD 185 AND MD 97	7960	7658	4%	Yes	3.41751	Yes
BETWEEN MD 355 AND MD 185	7960	7590	5%	Yes	4.19616	Yes
BETWEEN I-270 EAST AND MD 187	4015	3808	5%	Yes	3.30978	Yes
BETWEEN I-270 WEST AND MD 187	4165	3898	6%	Yes	4.20512	Yes
BETWEEN MD 190 AND I-270	7625	6900	10%	Yes	8.50736	No
BETWEEN CLARA BARTON PKWY AND CABIN JOHN PKWY	7150	6469	10%	Yes	8.25258	No
BETWEEN GW MEMORIAL PKWY AND CLARA BARTON PKWY	8315	7742	7%	Yes	6.39495	No

Figure C.9: I-270 Southbound 7-8 AM Volumes

Segment	7-8 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 SB				Calibration not met		
BETWEEN MD 85 AND MD 80	3290	3320	-1%	Yes	0.52184	Yes
BETWEEN MD 80 AND MD 109	3730	3549	5%	Yes	3.00025	Yes
BETWEEN MD 109 AND MD 121	4220	3969	6%	Yes	3.92259	Yes
BETWEEN MD 121 AND MD 27	5000	4747	5%	Yes	3.6241	Yes
BETWEEN MD 27 AND MD 118	4995	5144	-3%	Yes	2.09268	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	5455	5742	-5%	Yes	3.83571	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	7180	7525	-5%	Yes	4.02348	Yes
BETWEEN MD 124 AND MD 117	7565	8025	-6%	Yes	5.21014	No
BETWEEN MD 117 AND I-370	9300	9867	-6%	Yes	5.7919	No
BETWEEN I-370 AND SHADY GROVE RD	9715	9787	-1%	Yes	0.72913	Yes
BETWEEN SHADY GROVE RD AND MD 28	9225	9354	-1%	Yes	1.33842	Yes
BETWEEN MD 28 AND MD 189	9990	9752	2%	Yes	2.3955	Yes
BETWEEN MD 189 AND MONTROSE RD	10135	9713	4%	Yes	4.23613	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	10825	10203	6%	Yes	6.06606	No
BETWEEN I-270 SPLIT AND MD 187	5160	4796	7%	Yes	5.1591	No
BETWEEN MD 187 AND I-495	4485	4022	10%	No	7.09917	No
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	5665	5368	5%	Yes	3.99875	Yes
BETWEEN DEMOCRACY BLVD AND I-495	5575	5386	3%	Yes	2.55301	Yes

Figure C.10: I-270 Southbound 8-9 AM Volumes

Segment	8-9 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 SB				Calibration not met		
BETWEEN MD 85 AND MD 80	3085	3096	0%	Yes	0.19787	Yes
BETWEEN MD 80 AND MD 109	3375	3526	-4%	Yes	2.57061	Yes
BETWEEN MD 109 AND MD 121	3790	3958	-4%	Yes	2.69917	Yes
BETWEEN MD 121 AND MD 27	4460	4659	-4%	Yes	2.9471	Yes
BETWEEN MD 27 AND MD 118	4555	4833	-6%	Yes	4.05764	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	5135	5606	-9%	Yes	6.42708	No
BETWEEN MIDDLEBROOK ROAD AND MD 124	6740	7274	-8%	Yes	6.37933	No
BETWEEN MD 124 AND MD 117	7255	7695	-6%	Yes	5.08917	No
BETWEEN MD 117 AND I-370	8965	9395	-5%	Yes	4.48794	Yes
BETWEEN I-370 AND SHADY GROVE RD	8905	8862	0%	Yes	0.45622	Yes
BETWEEN SHADY GROVE RD AND MD 28	8310	8239	1%	Yes	0.78053	Yes
BETWEEN MD 28 AND MD 189	9065	8695	4%	Yes	3.92641	Yes
BETWEEN MD 189 AND MONTROSE RD	9295	9072	2%	Yes	2.32702	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	10005	9818	2%	Yes	1.87833	Yes
BETWEEN I-270 SPLIT AND MD 187	4735	4719	0%	Yes	0.23272	Yes
BETWEEN MD 187 AND I-495	3975	3747	6%	Yes	3.66931	Yes
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	5270	5344	-1%	Yes	1.0158	Yes
BETWEEN DEMOCRACY BLVD AND I-495	5060	5436	-7%	Yes	5.19028	No

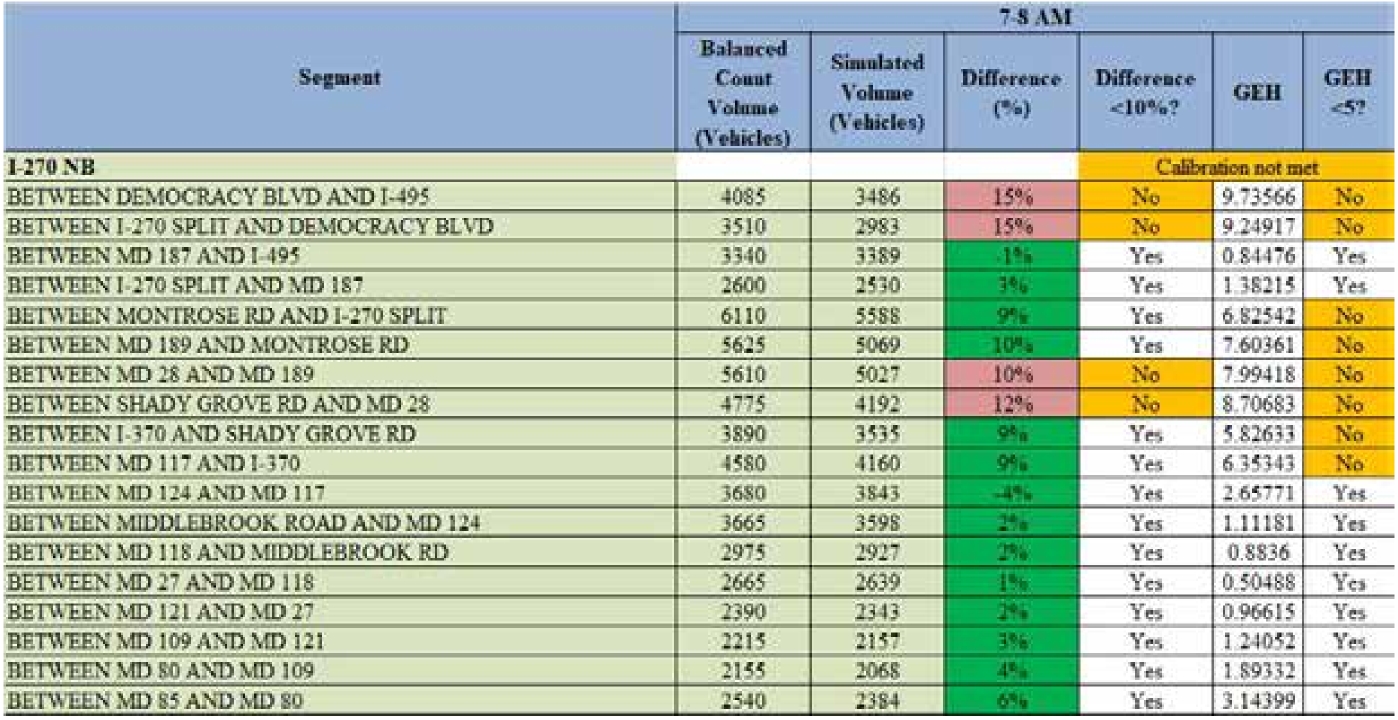
Figure C.11: I-270 Southbound 4-5 PM Volumes

Segment	4-5 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 SB				Calibrated		
BETWEEN MD 85 AND MD 80	2360	2352	0%	Yes	0.16482	Yes
BETWEEN MD 80 AND MD 109	2215	2143	3%	Yes	1.54242	Yes
BETWEEN MD 109 AND MD 121	2315	2217	4%	Yes	2.05871	Yes
BETWEEN MD 121 AND MD 27	2700	2613	3%	Yes	1.68797	Yes
BETWEEN MD 27 AND MD 118	3120	3038	3%	Yes	1.47778	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	3700	3631	2%	Yes	1.13968	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	4595	4492	2%	Yes	1.52807	Yes
BETWEEN MD 124 AND MD 117	4930	4903	1%	Yes	0.38507	Yes
BETWEEN MD 117 AND I-370	6565	6512	1%	Yes	0.65545	Yes
BETWEEN I-370 AND SHADY GROVE RD	5865	5806	1%	Yes	0.77235	Yes
BETWEEN SHADY GROVE RD AND MD 28	6565	6798	-4%	Yes	2.85049	Yes
BETWEEN MD 28 AND MD 189	7330	7513	-2%	Yes	2.12425	Yes
BETWEEN MD 189 AND MONTROSE RD	7110	7257	-2%	Yes	1.7344	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	7310	7215	1%	Yes	1.11476	Yes
BETWEEN I-270 SPLIT AND MD 187	3450	3587	-4%	Yes	2.30963	Yes
BETWEEN MD 187 AND I-495	3665	3671	0%	Yes	0.09907	Yes
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	3860	3565	8%	Yes	4.8416	Yes
BETWEEN DEMOCRACY BLVD AND I-495	3595	3427	5%	Yes	2.83527	Yes

Figure C.12: I-270 Southbound 5-6 PM Volumes

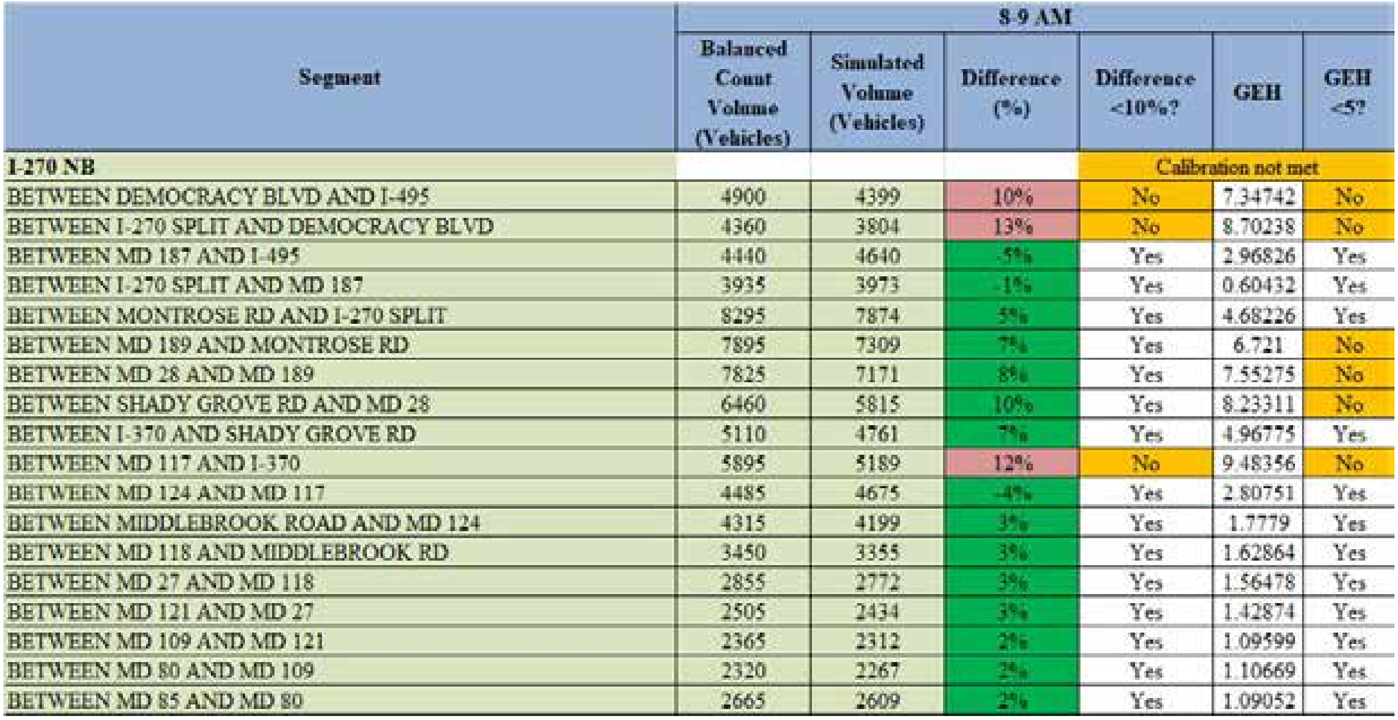
Segment	5-6 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 SB				Calibrated		
BETWEEN MD 85 AND MD 80	2730	2725	0%	Yes	0.09574	Yes
BETWEEN MD 80 AND MD 109	2535	2500	1%	Yes	0.69756	Yes
BETWEEN MD 109 AND MD 121	2650	2599	2%	Yes	0.99551	Yes
BETWEEN MD 121 AND MD 27	3130	3066	2%	Yes	1.14984	Yes
BETWEEN MD 27 AND MD 118	3300	3252	1%	Yes	0.83863	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	3905	3852	1%	Yes	0.85103	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	5020	4954	1%	Yes	0.9346	Yes
BETWEEN MD 124 AND MD 117	5350	5352	0%	Yes	0.02734	Yes
BETWEEN MD 117 AND I-370	7050	7048	0%	Yes	0.02382	Yes
BETWEEN I-370 AND SHADY GROVE RD	6320	6307	0%	Yes	0.16361	Yes
BETWEEN SHADY GROVE RD AND MD 28	7305	7557	-3%	Yes	2.92332	Yes
BETWEEN MD 28 AND MD 189	8120	8357	-3%	Yes	2.6111	Yes
BETWEEN MD 189 AND MONTROSE RD	7720	7933	-3%	Yes	2.40766	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	7535	7487	1%	Yes	0.55385	Yes
BETWEEN I-270 SPLIT AND MD 187	3475	3567	-3%	Yes	1.55044	Yes
BETWEEN MD 187 AND I-495	3625	3533	3%	Yes	1.53783	Yes
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	4060	3888	4%	Yes	2.72844	Yes
BETWEEN DEMOCRACY BLVD AND I-495	3460	3283	5%	Yes	3.04833	Yes

Figure C.13: I-270 Northbound 7-8 AM Volumes



Segment	7-8 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 NB				Calibration not met		
BETWEEN DEMOCRACY BLVD AND I-495	4085	3486	15%	No	9.73566	No
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	3510	2983	15%	No	9.24917	No
BETWEEN MD 187 AND I-495	3340	3389	-1%	Yes	0.84476	Yes
BETWEEN I-270 SPLIT AND MD 187	2600	2530	3%	Yes	1.38215	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	6110	5588	9%	Yes	6.82542	No
BETWEEN MD 189 AND MONTROSE RD	5625	5069	10%	Yes	7.60361	No
BETWEEN MD 28 AND MD 189	5610	5027	10%	No	7.99418	No
BETWEEN SHADY GROVE RD AND MD 28	4775	4192	12%	No	8.70683	No
BETWEEN I-370 AND SHADY GROVE RD	3890	3535	9%	Yes	5.82633	No
BETWEEN MD 117 AND I-370	4580	4160	9%	Yes	6.35343	No
BETWEEN MD 124 AND MD 117	3680	3843	-4%	Yes	2.65771	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	3665	3598	2%	Yes	1.11181	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	2975	2927	2%	Yes	0.8836	Yes
BETWEEN MD 27 AND MD 118	2665	2639	1%	Yes	0.50488	Yes
BETWEEN MD 121 AND MD 27	2390	2343	2%	Yes	0.96615	Yes
BETWEEN MD 109 AND MD 121	2215	2157	3%	Yes	1.24052	Yes
BETWEEN MD 80 AND MD 109	2155	2068	4%	Yes	1.89332	Yes
BETWEEN MD 85 AND MD 80	2540	2384	6%	Yes	3.14399	Yes

Figure C.14: I-270 Northbound 8-9 AM Volumes



Segment	8-9 AM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 NB				Calibration not met		
BETWEEN DEMOCRACY BLVD AND I-495	4900	4399	10%	No	7.34742	No
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	4360	3804	13%	No	8.70238	No
BETWEEN MD 187 AND I-495	4440	4640	-5%	Yes	2.96826	Yes
BETWEEN I-270 SPLIT AND MD 187	3935	3973	-1%	Yes	0.60432	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	8295	7874	5%	Yes	4.68226	Yes
BETWEEN MD 189 AND MONTROSE RD	7895	7309	7%	Yes	6.721	No
BETWEEN MD 28 AND MD 189	7825	7171	8%	Yes	7.55275	No
BETWEEN SHADY GROVE RD AND MD 28	6460	5815	10%	Yes	8.23311	No
BETWEEN I-370 AND SHADY GROVE RD	5110	4761	7%	Yes	4.96775	Yes
BETWEEN MD 117 AND I-370	5895	5189	12%	No	9.48356	No
BETWEEN MD 124 AND MD 117	4485	4675	-4%	Yes	2.80751	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	4315	4199	3%	Yes	1.7779	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	3450	3355	3%	Yes	1.62864	Yes
BETWEEN MD 27 AND MD 118	2855	2772	3%	Yes	1.56478	Yes
BETWEEN MD 121 AND MD 27	2505	2434	3%	Yes	1.42874	Yes
BETWEEN MD 109 AND MD 121	2365	2312	2%	Yes	1.09599	Yes
BETWEEN MD 80 AND MD 109	2320	2267	2%	Yes	1.10669	Yes
BETWEEN MD 85 AND MD 80	2665	2609	2%	Yes	1.09052	Yes

Figure C.15: I-270 Northbound 4-5 PM Volumes

Segment	4-5 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 NB				Calibration not met		
BETWEEN DEMOCRACY BLVD AND I-495	5135	4802	6%	Yes	4.72424	Yes
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	6295	5305	16%	No	12.9993	No
BETWEEN MD 187 AND I-495	4300	4227	2%	Yes	1.11799	Yes
BETWEEN I-270 SPLIT AND MD 187	5130	4901	4%	Yes	3.23354	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	11425	10770	6%	Yes	6.21769	No
BETWEEN MD 189 AND MONTROSE RD	11740	11161	5%	Yes	5.41086	No
BETWEEN MD 28 AND MD 189	11980	11418	5%	Yes	5.19591	No
BETWEEN SHADY GROVE RD AND MD 28	10985	10760	2%	Yes	2.15783	Yes
BETWEEN I-370 AND SHADY GROVE RD	10995	10469	5%	Yes	5.07745	No
BETWEEN MD 117 AND I-370	10715	10308	4%	Yes	3.96974	Yes
BETWEEN MD 124 AND MD 117	9170	8796	4%	Yes	3.94603	Yes
BETWEEN MIDDLEBROOK ROAD AND MD 124	8250	8031	3%	Yes	2.42727	Yes
BETWEEN MD 118 AND MIDDLEBROOK RD	6945	6736	3%	Yes	2.52698	Yes
BETWEEN MD 27 AND MD 118	6365	6257	2%	Yes	1.35949	Yes
BETWEEN MD 121 AND MD 27	5200	4947	5%	Yes	3.55195	Yes
BETWEEN MD 109 AND MD 121	4630	4263	8%	Yes	5.50373	No
BETWEEN MD 80 AND MD 109	4555	4192	8%	Yes	5.48899	No
BETWEEN MD 85 AND MD 80	4625	4230	9%	Yes	5.93633	No

Figure C.16: I-270 Northbound 5-6 PM Volumes

Segment	5-6 PM					
	Balanced Count Volume (Vehicles)	Simulated Volume (Vehicles)	Difference (%)	Difference <10%?	GEH	GEH <5?
I-270 NB				Calibration not met		
BETWEEN DEMOCRACY BLVD AND I-495	4940	4690	5%	Yes	3.60281	Yes
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	6290	5199	17%	No	14.3946	No
BETWEEN MD 187 AND I-495	4350	4107	6%	Yes	3.73691	Yes
BETWEEN I-270 SPLIT AND MD 187	5150	4911	5%	Yes	3.36971	Yes
BETWEEN MONTROSE RD AND I-270 SPLIT	11440	10862	5%	Yes	5.47357	No
BETWEEN MD 189 AND MONTROSE RD	11655	11151	4%	Yes	4.71977	Yes
BETWEEN MD 28 AND MD 189	11615	11158	4%	Yes	4.28273	Yes
BETWEEN SHADY GROVE RD AND MD 28	10465	10461	0%	Yes	0.0391	Yes
BETWEEN I-370 AND SHADY GROVE RD	10445	10112	3%	Yes	3.28458	Yes
BETWEEN MD 117 AND I-370	10610	10028	5%	Yes	5.72933	No
BETWEEN MD 124 AND MD 117	9240	8648	6%	Yes	6.25973	No
BETWEEN MIDDLEBROOK ROAD AND MD 124	8340	7888	5%	Yes	5.01789	No
BETWEEN MD 118 AND MIDDLEBROOK RD	7025	6719	4%	Yes	3.6913	Yes
BETWEEN MD 27 AND MD 118	6475	6205	4%	Yes	3.39093	Yes
BETWEEN MD 121 AND MD 27	5280	4898	7%	Yes	5.35485	No
BETWEEN MD 109 AND MD 121	4645	4320	7%	Yes	4.85426	Yes
BETWEEN MD 80 AND MD 109	4540	4258	6%	Yes	4.25179	Yes
BETWEEN MD 85 AND MD 80	4445	4177	6%	Yes	4.08174	Yes

APPENDIX D

Volume Charts

Figure D.1: I-495 Inner Loop – 7-8 AM VISSIM Model and Balanced Count Volume Comparison

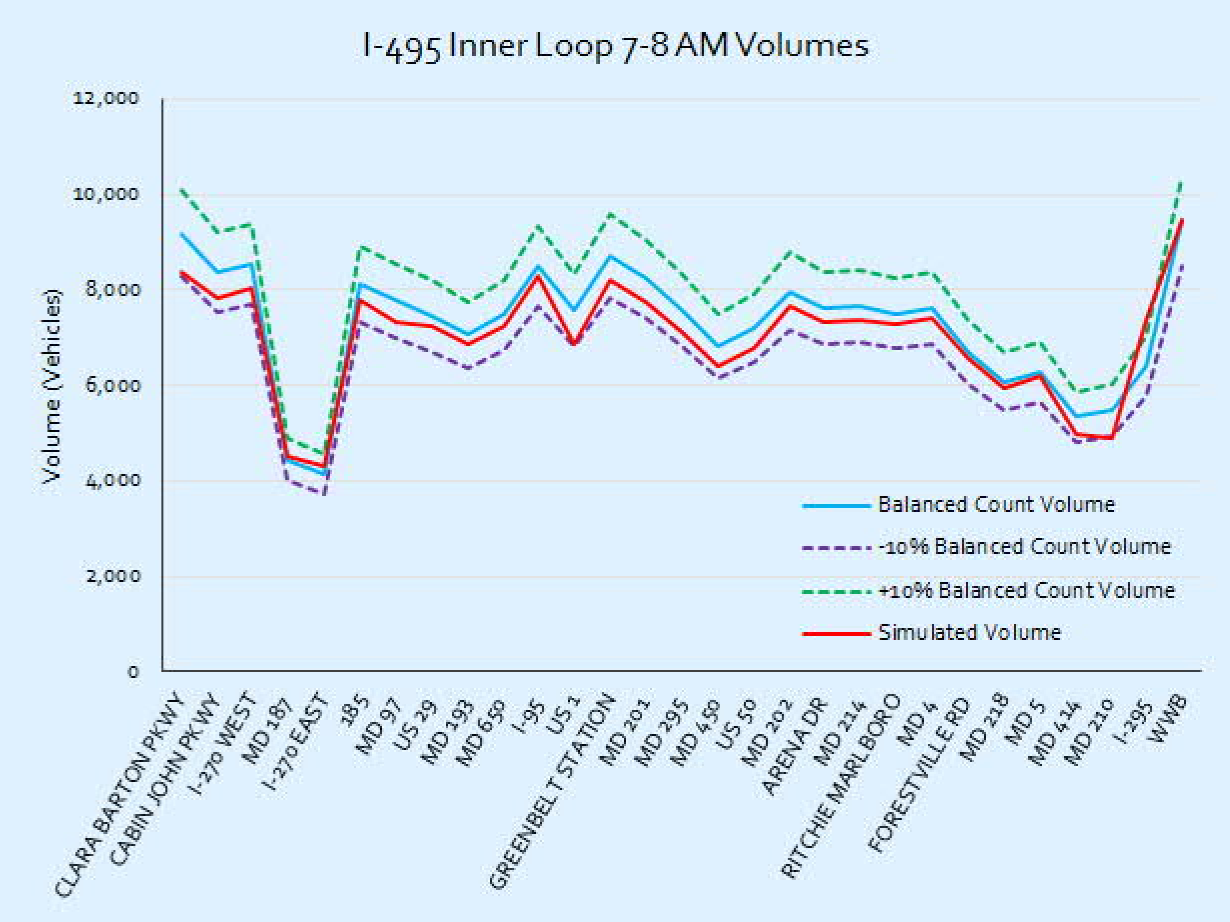


Figure D.2: I-495 Inner Loop – 8-9 AM VISSIM Model and Balanced Count Volume Comparison

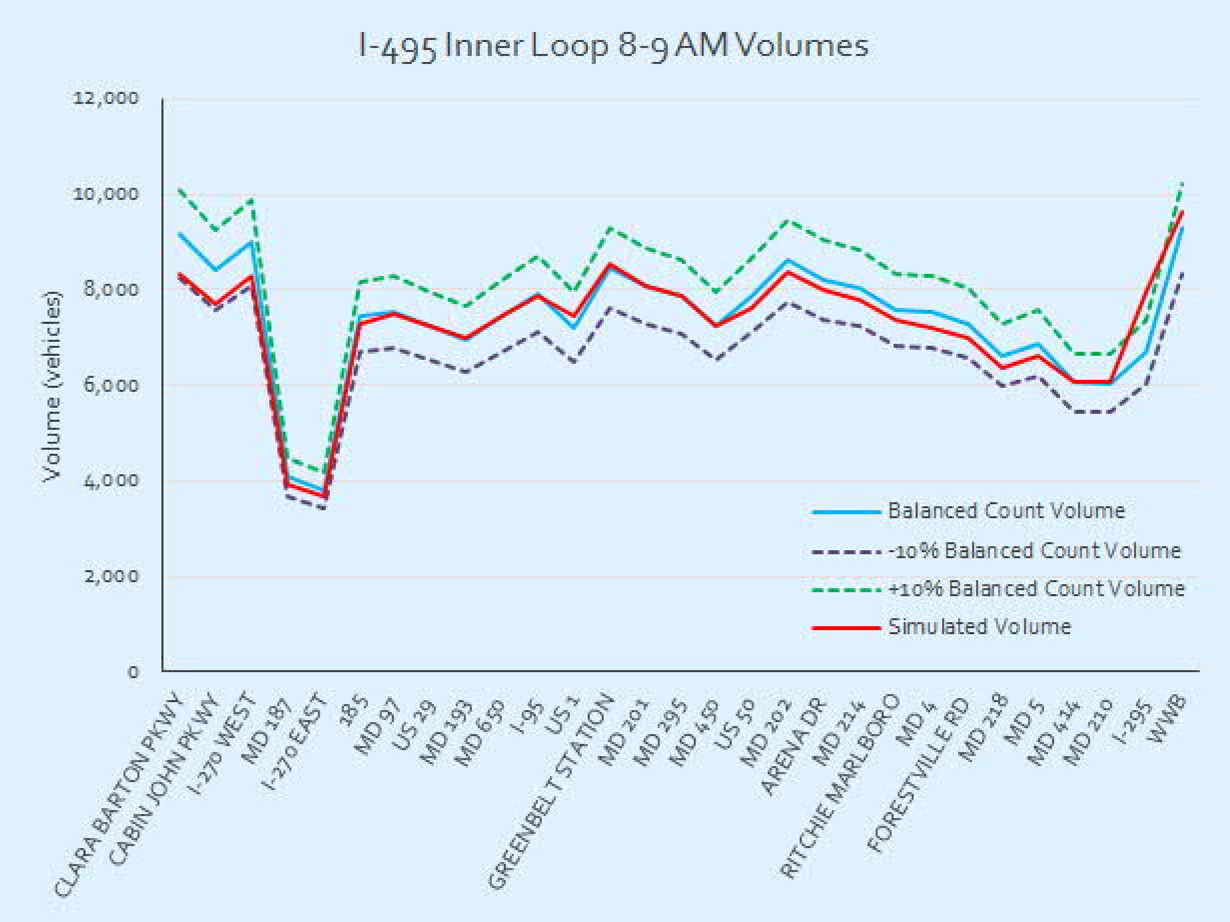


Figure D.3: I-495 Inner Loop – 4-5 PM VISSIM Model and Balanced Count Volume Comparison

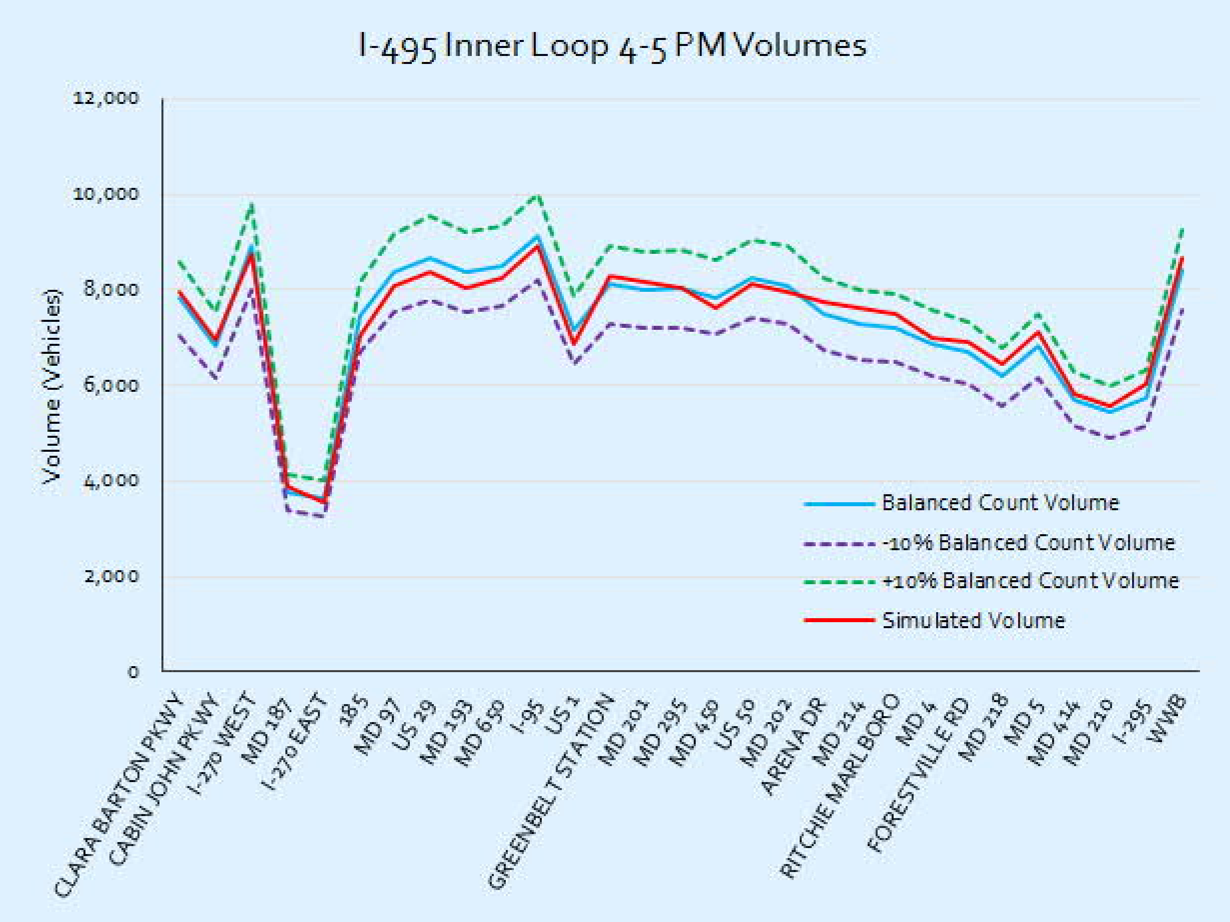


Figure D.4: I-495 Inner Loop – 5-6 PM VISSIM Model and Balanced Count Volume Comparison

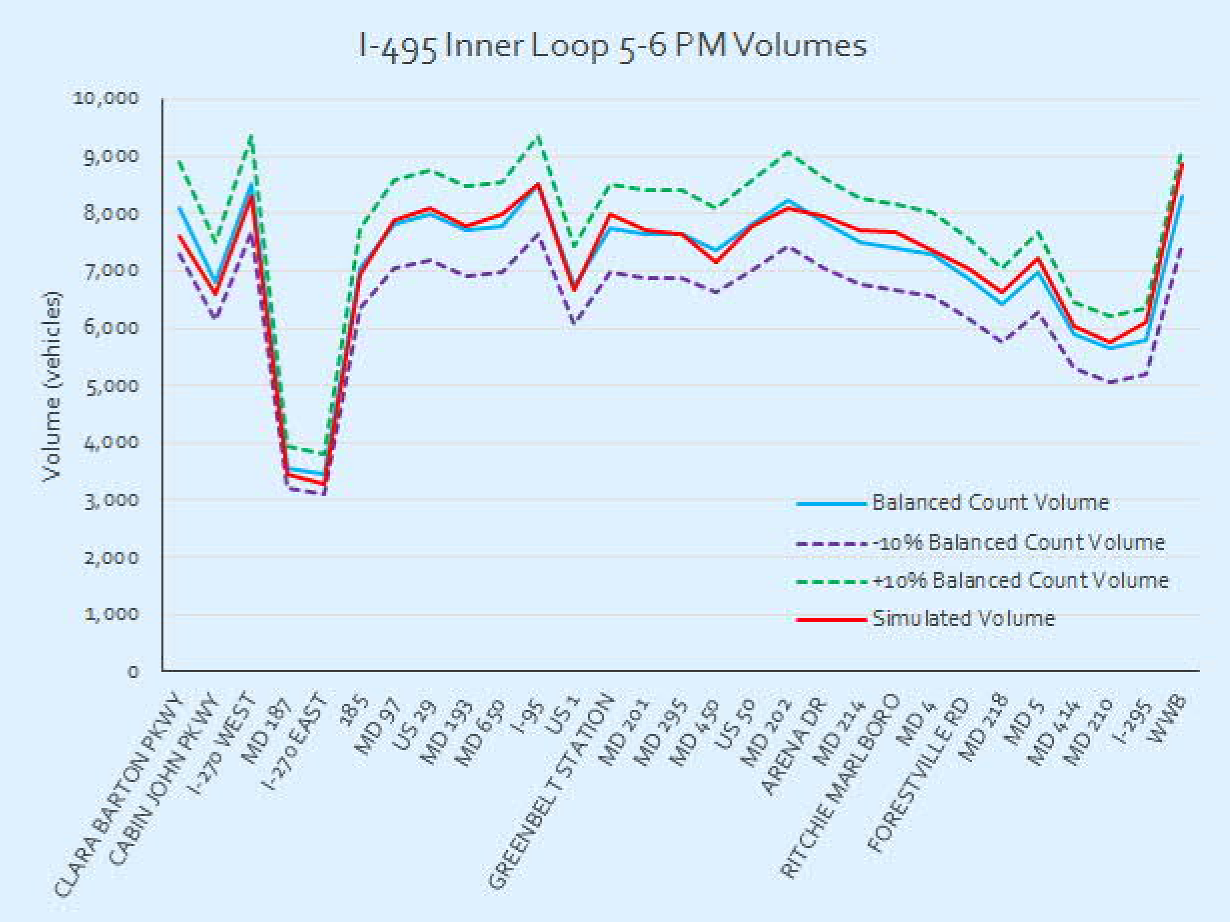


Figure D.5: I-495 Outer Loop – 7-8 AM VISSIM Model and Balanced Count Volume Comparison

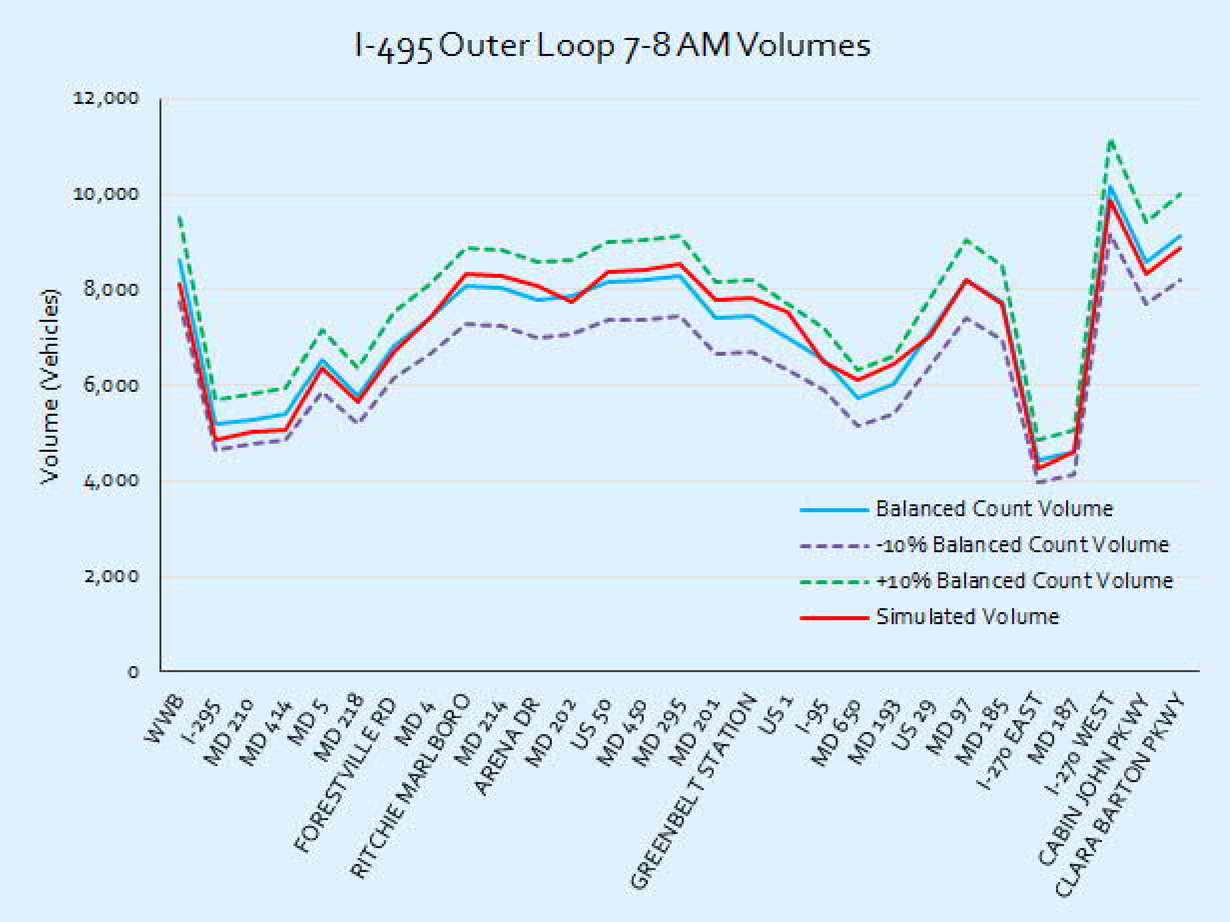


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Figure D.6: I-495 Outer Loop – 8-9 AM VISSIM Model and Balanced Count Volume Comparison

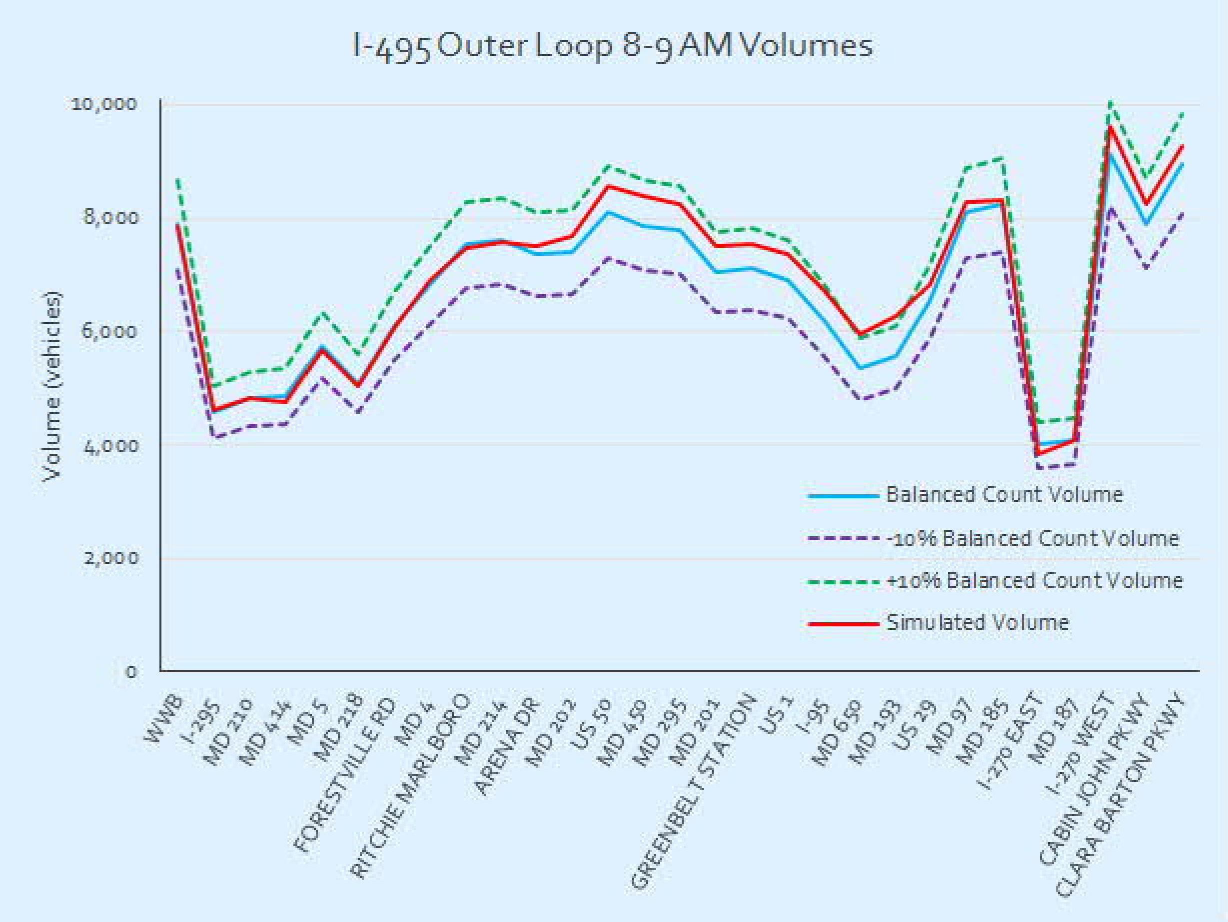


Figure D.7: I-495 Outer Loop – 4-5 PM VISSIM Model and Balanced Count Volume Comparison

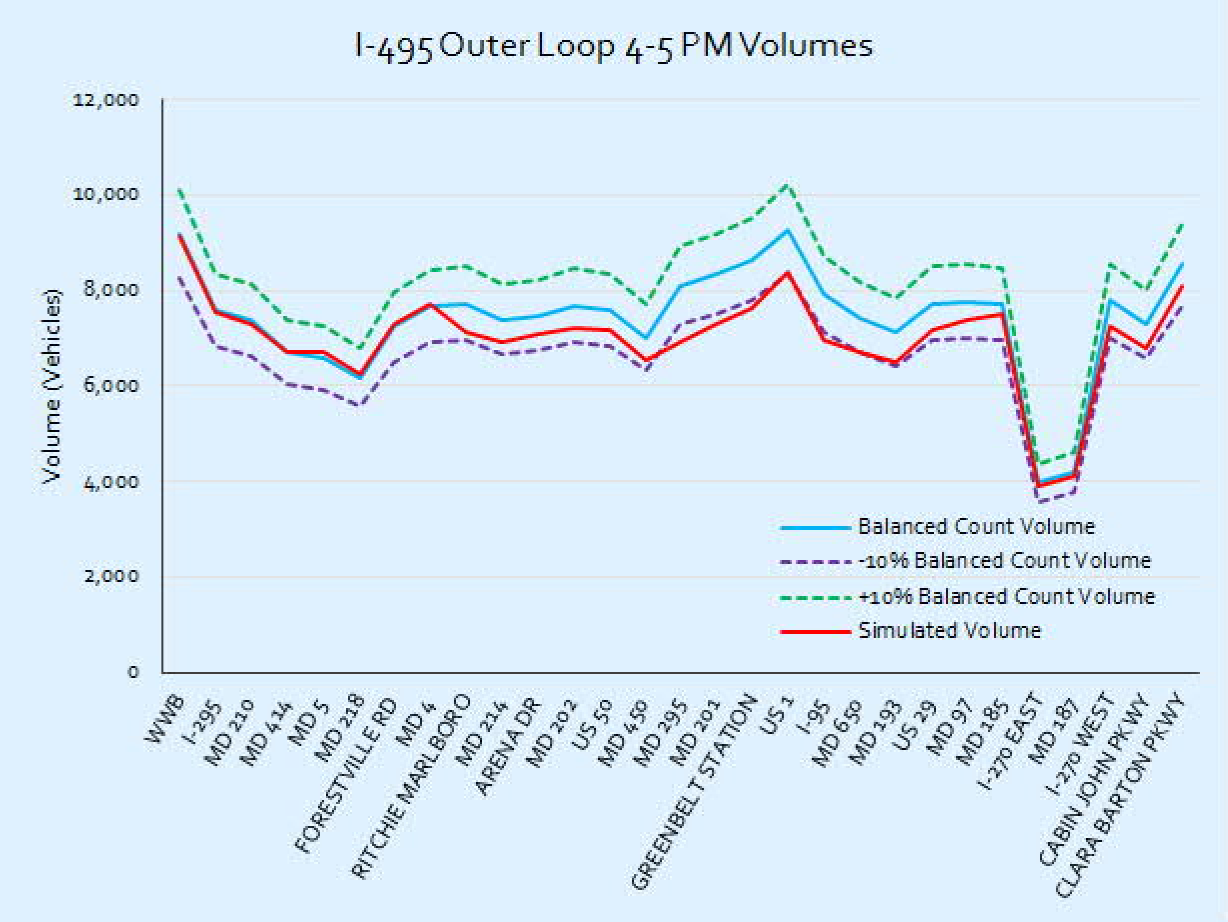


Figure D.8: I-495 Outer Loop – 5-6 PM VISSIM Model and Balanced Count Volume Comparison

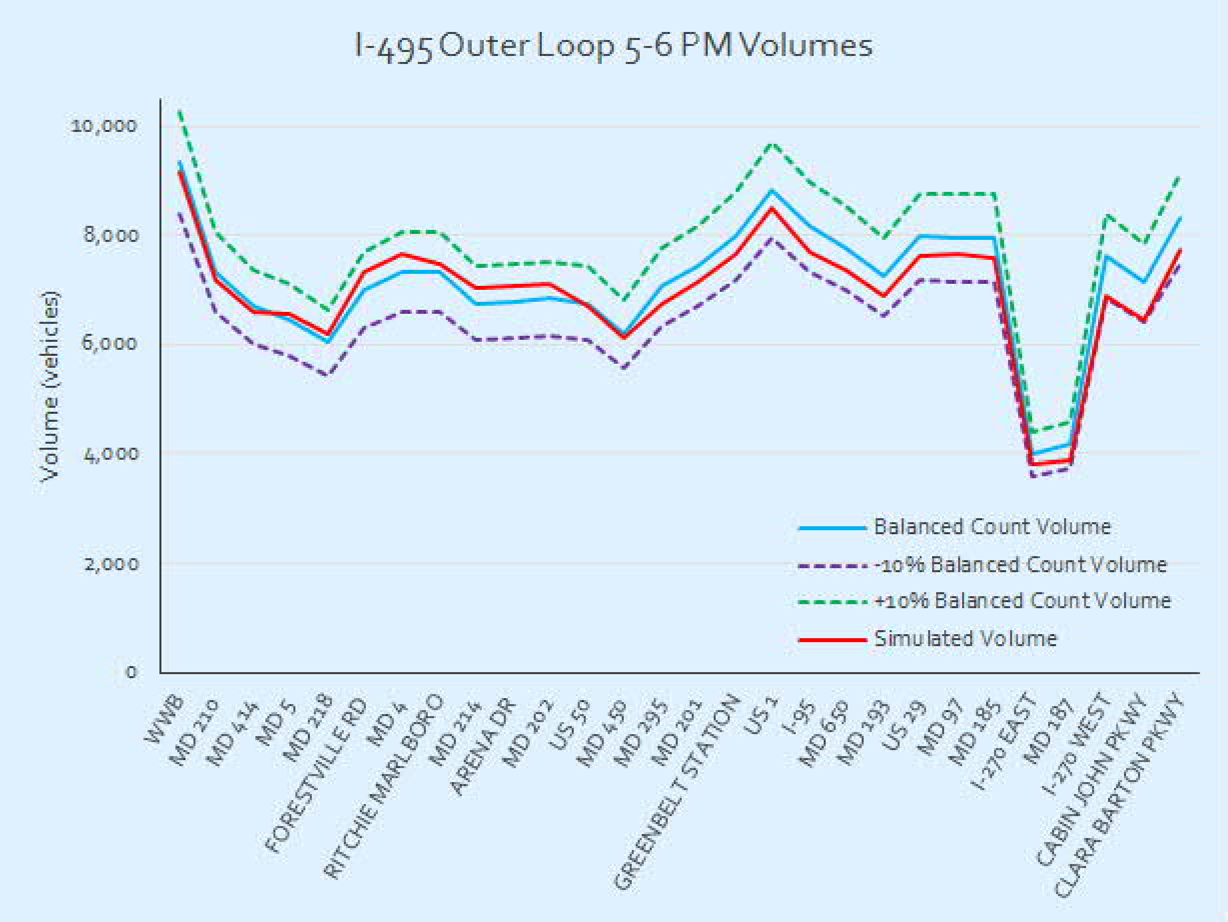


Figure D.9: I-270 Southbound – 7-8 AM VISSIM Model and Balanced Count Volume Comparison

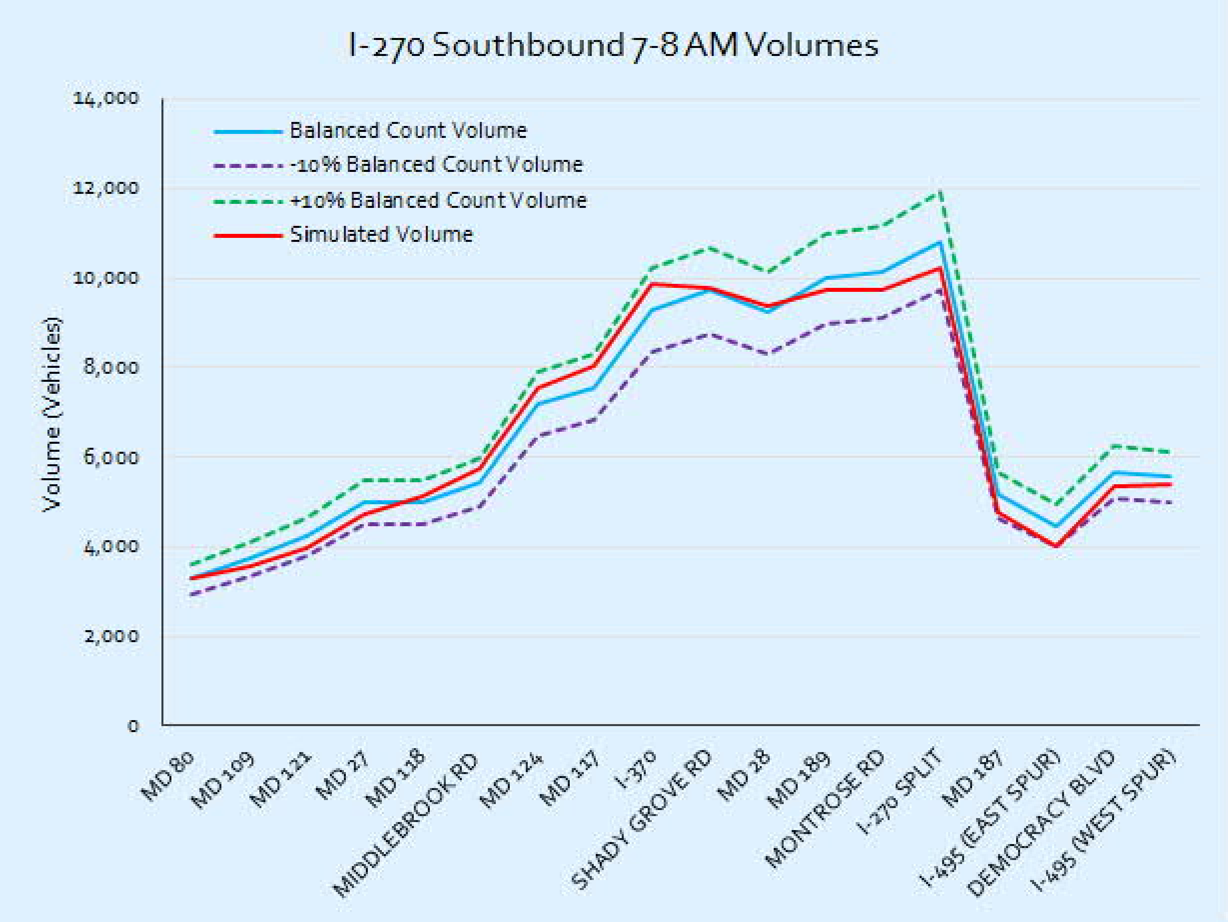


Figure D.10: I-270 Southbound – 8-9 AM VISSIM Model and Balanced Count Volume Comparison

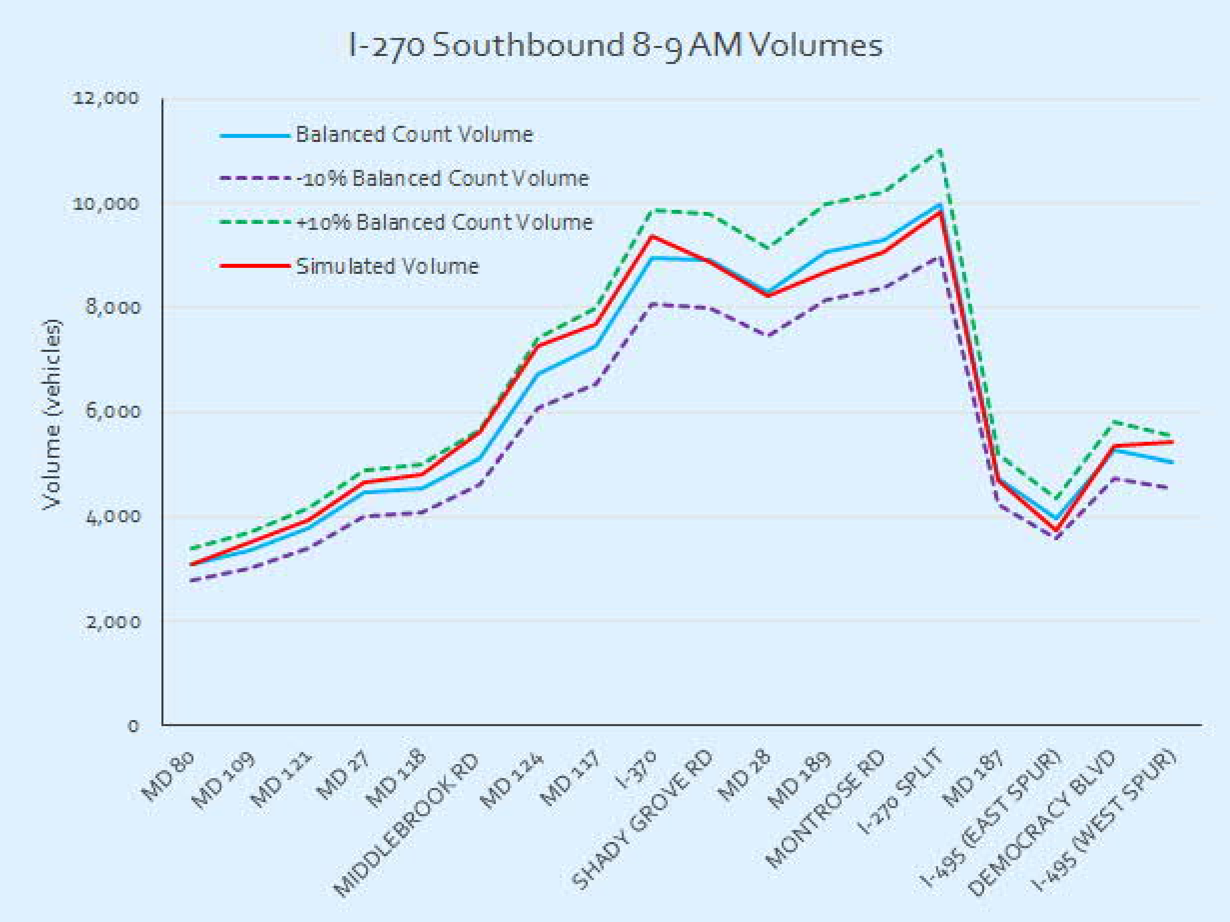


Figure D.11: I-270 Southbound – 4-5 PM VISSIM Model and Balanced Count Volume Comparison

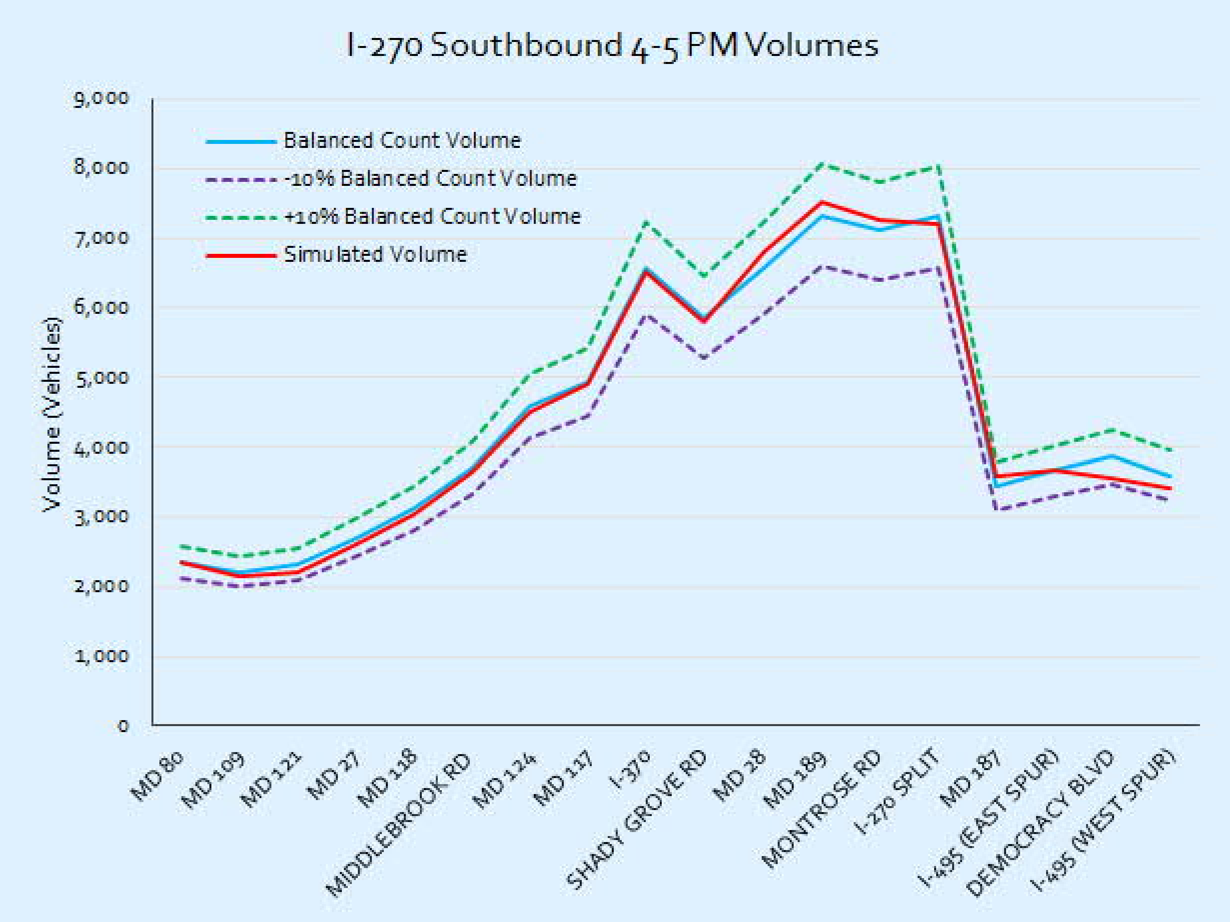


Figure D.12: I-270 Southbound – 5-6 PM VISSIM Model and Balanced Count Volume Comparison

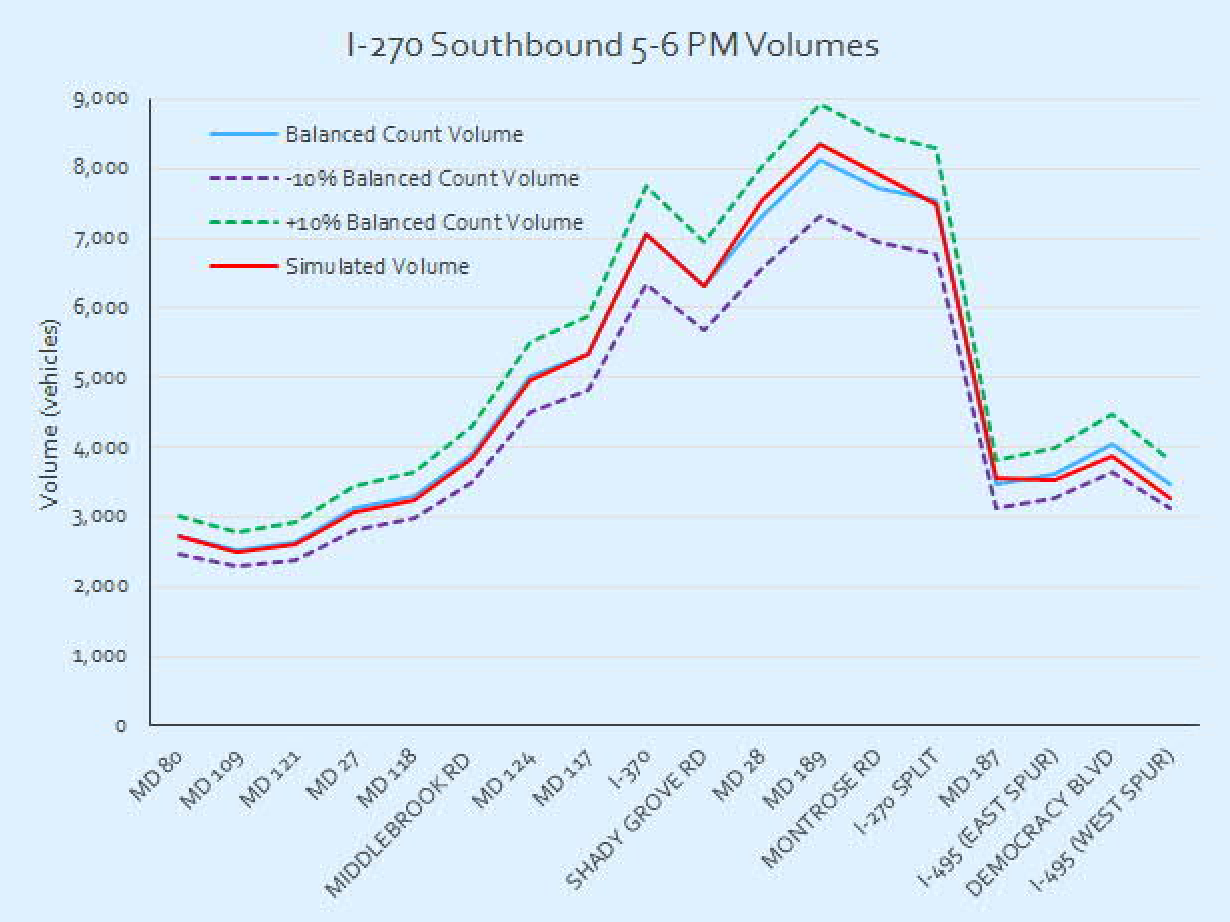


Figure D.13: I-270 Northbound – 7-8 AM VISSIM Model and Balanced Count Volume Comparison

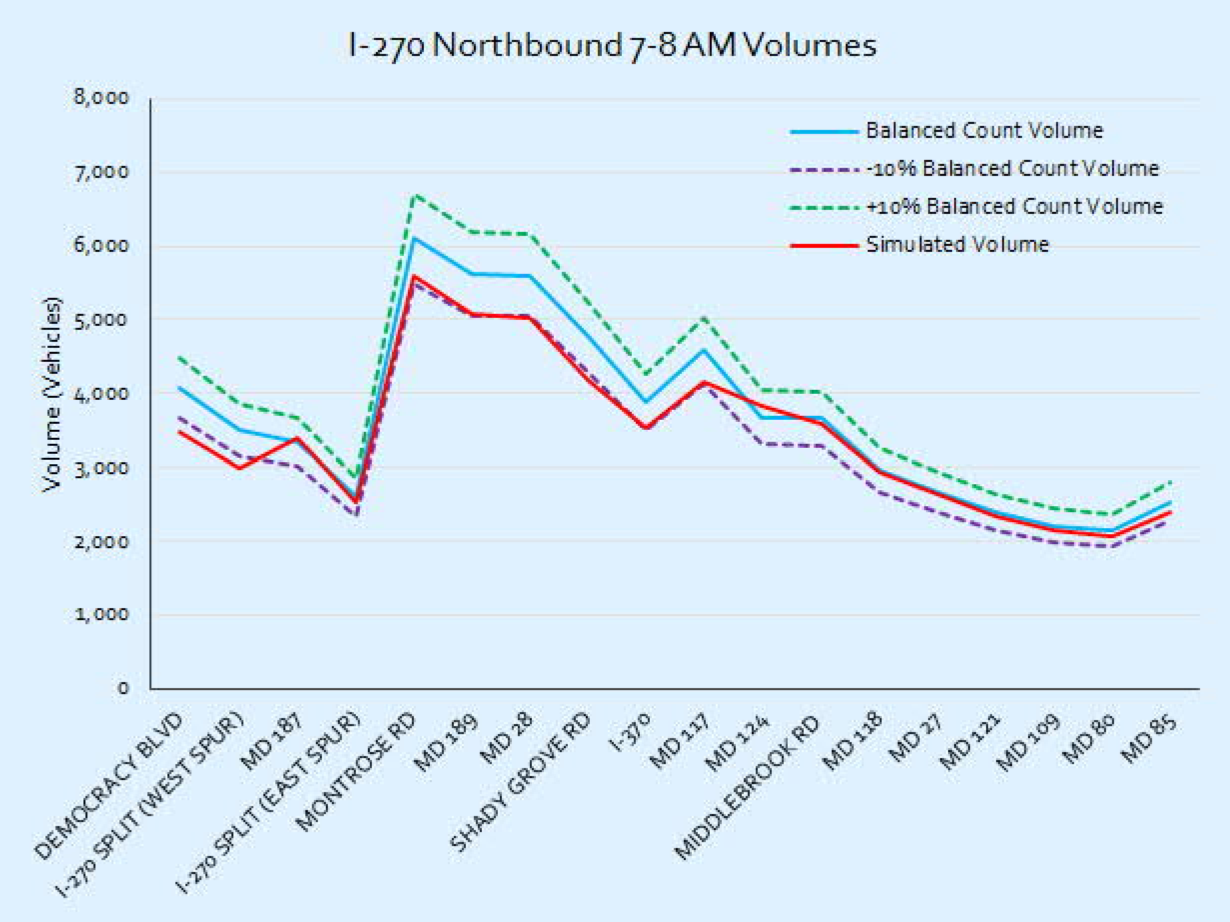


Figure D.14: I-270 Northbound – 8-9 AM VISSIM Model and Balanced Count Volume Comparison

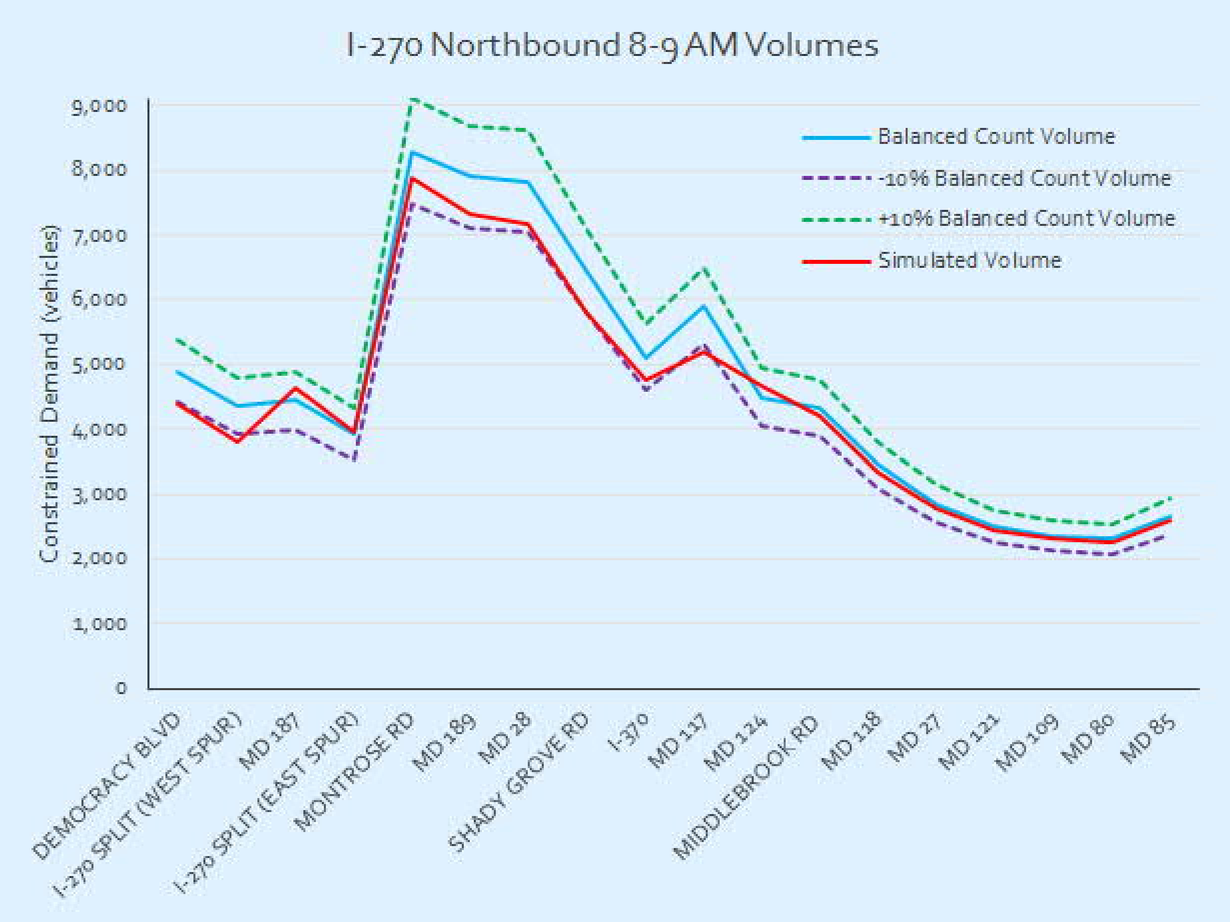


Figure D.15: I-270 Northbound – 4-5 PM VISSIM Model and Balanced Count Volume Comparison

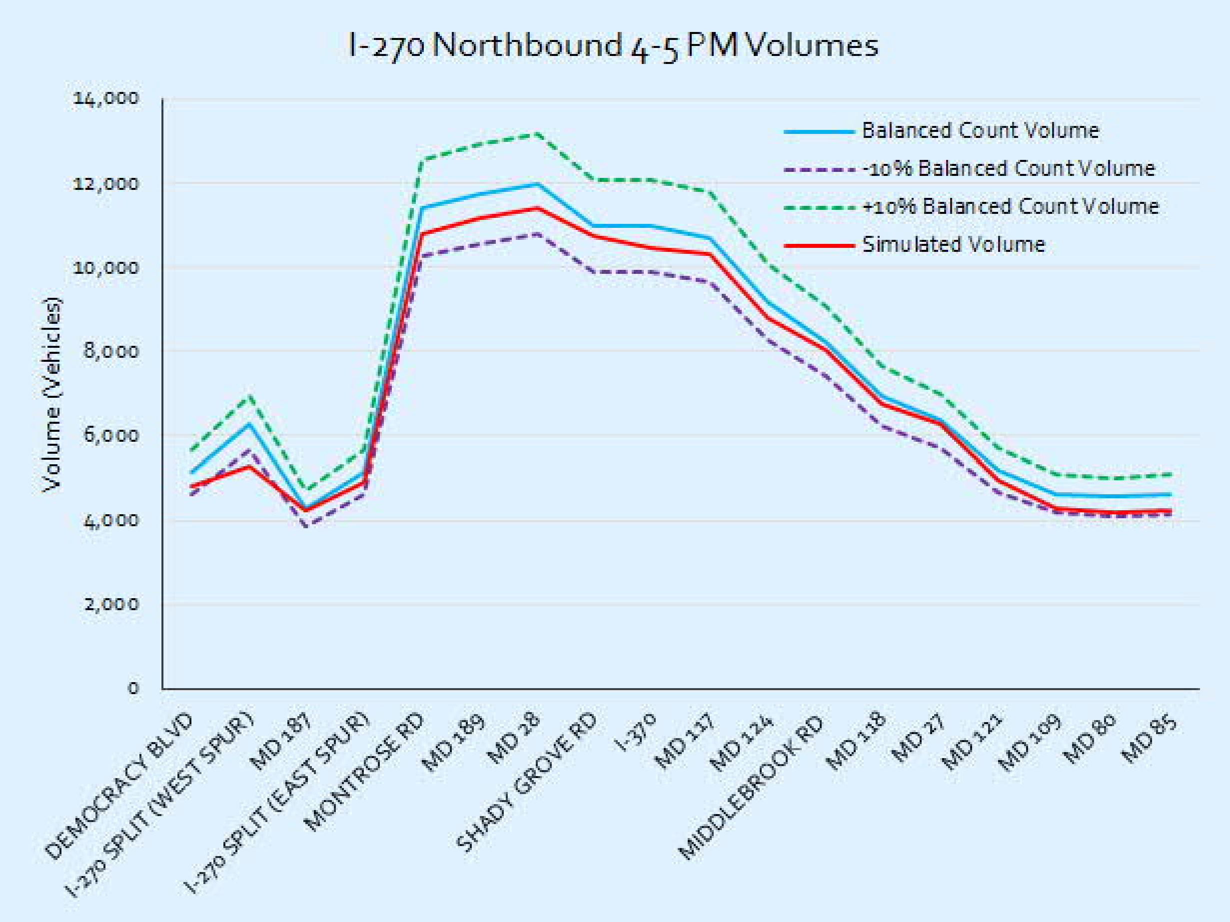
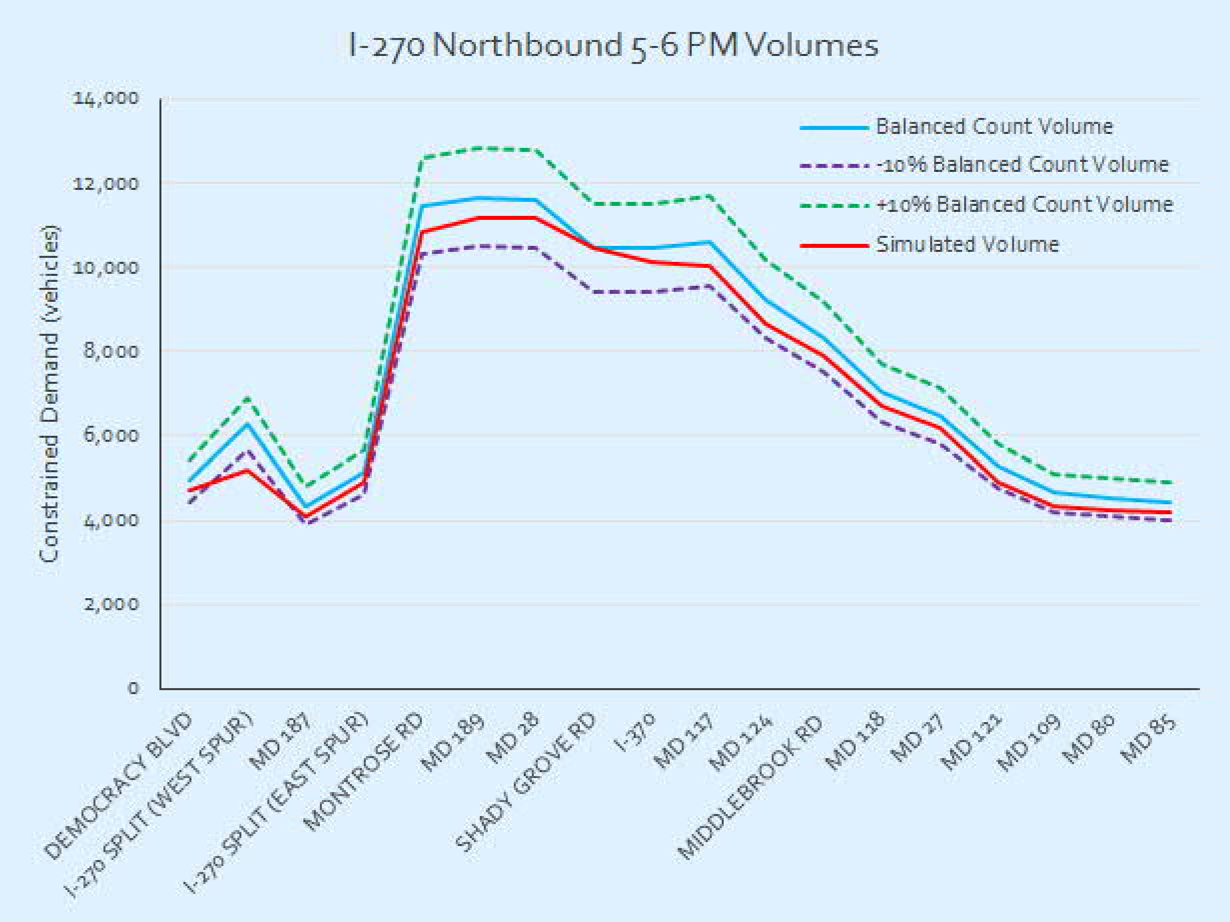


Figure D.16: I-270 Northbound – 5-6 PM VISSIM Model and Balanced Count Volume Comparison



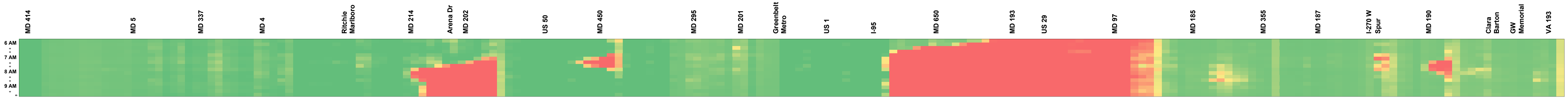
APPENDIX E:

Existing and Future Speeds and Travel Times

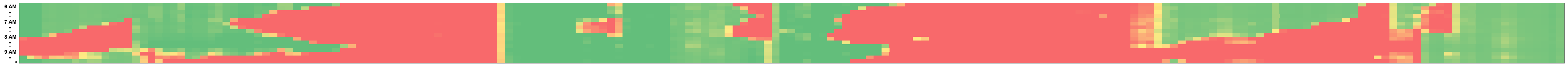
I-495 OL Speed AM

1/27/2022

Existing AM - I-495 OL Speed Map

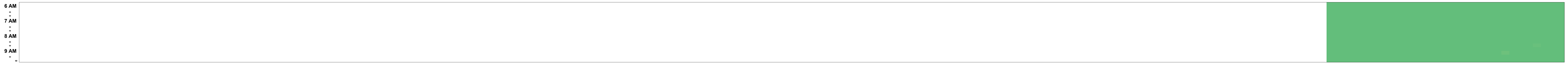


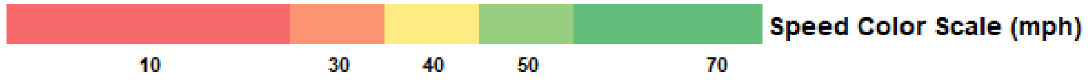
2045 No-Build AM - I-495 OL Speed Map



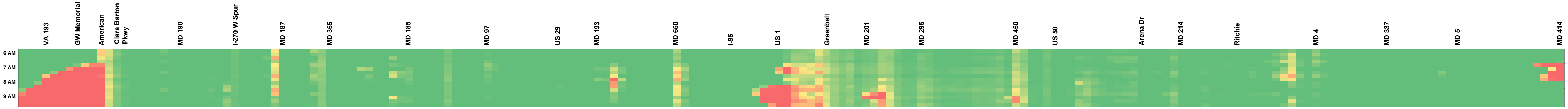
2045 Preferred AM - I-495 OL Speed Map (GP)

2045 Preferred AM - I-495 OL Speed Map (HOT)

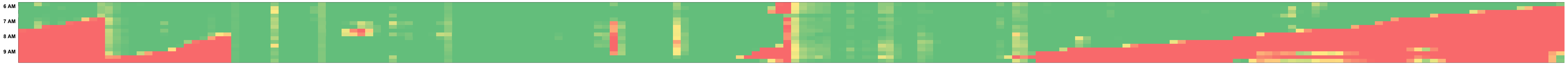




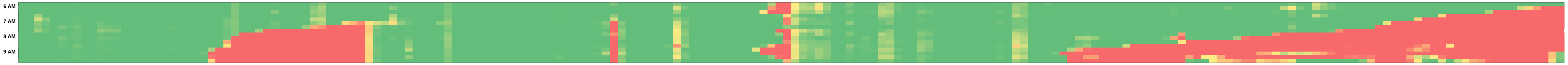
Existing AM - I-495 IL Speed Map



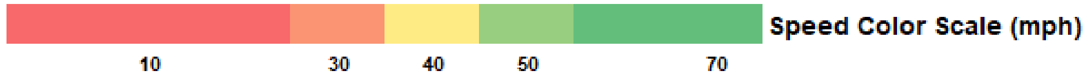
2045 No-Build AM - I-495 IL Speed Map



2045 Preferred AM - I-495 IL Speed Map (GP)

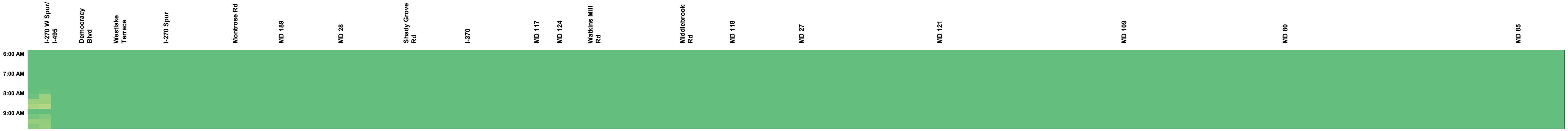


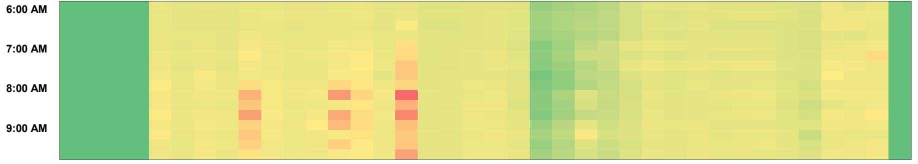
2045 Preferred AM - I-495 IL Speed Map (HOT)



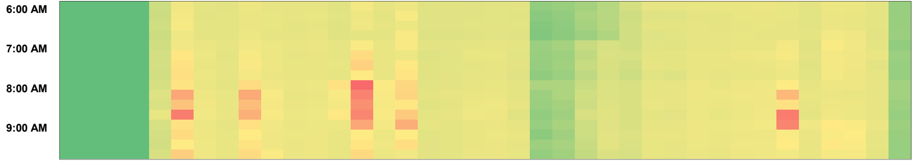
I-270 NB Speed AM

1/27/2022

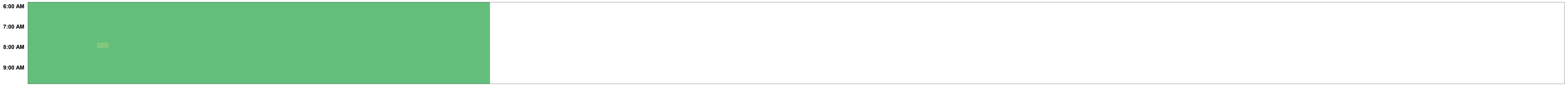

Existing AM - I-270 NB Speed Map

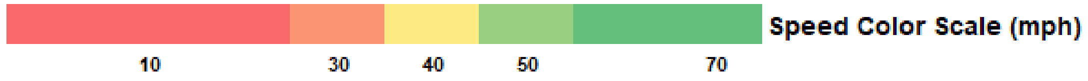

Existing AM - I-270 NB Local Speed Map


2045 No-Build AM - I-270 NB Speed Map


2045 No-Build AM - I-270 NB Local Speed Map


2045 Preferred AM - I-270 NB Speed Map (GP)

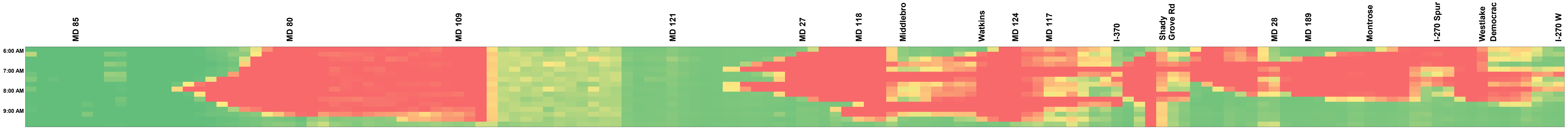

2045 Preferred AM - I-270 NB Speed Map (HOT)



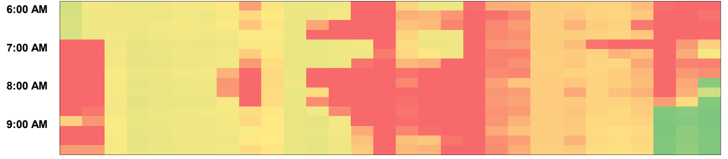
I-270 SB Speed AM

1/27/2022

Existing AM - I-270 SB Speed Map



Existing AM - I-270 SB Local Speed Map

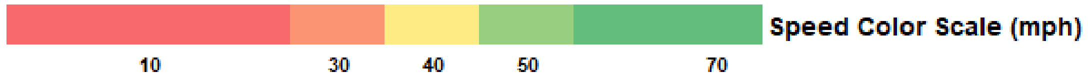


2045 No-Build AM - I-270 SB Speed Map

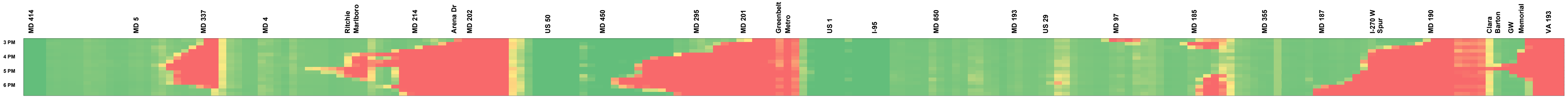
2045 No-Build AM - I-270 SB Local Speed Map

2045 Preferred AM - I-270 SB Speed Map (GP)

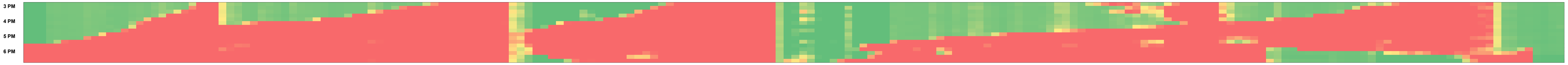
2045 Preferred AM - I-270 SB Speed Map (HOT)



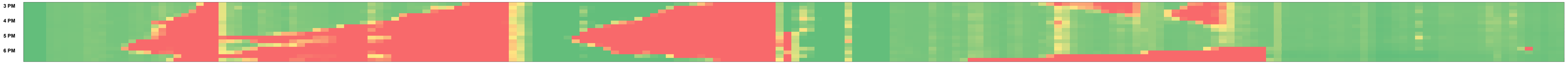
Existing PM - I-495 OL Speed Map



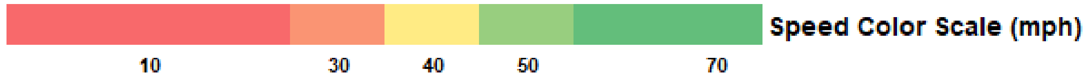
2045 No-Build PM - I-495 OL Speed Map



2045 Preferred PM - I-495 OL Speed Map (GP)



2045 Preferred PM - I-495 OL Speed Map (HOT)



I-495 IL Speed PM

1/27/2022

Existing PM - I-495 IL Speed Map

2045 No-Build PM - I-495 IL Speed Map

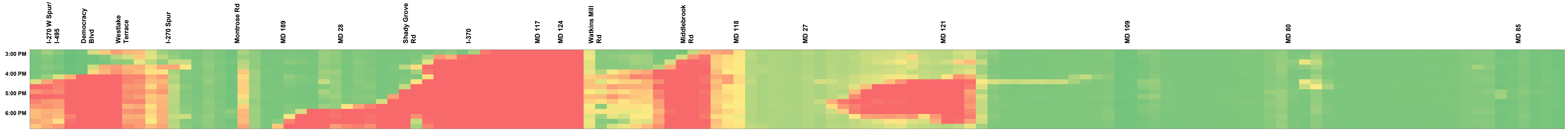
2045 Preferred PM - I-495 IL Speed Map (GP)

2045 Preferred PM - I-495 IL Speed Map (HOT)

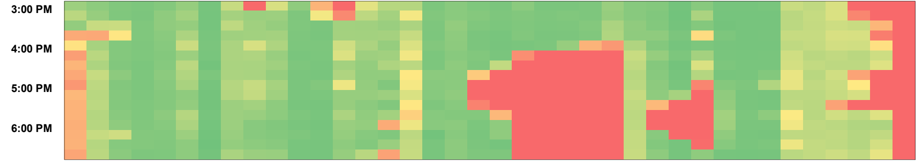
I-270 NB Speed PM

1/27/2022

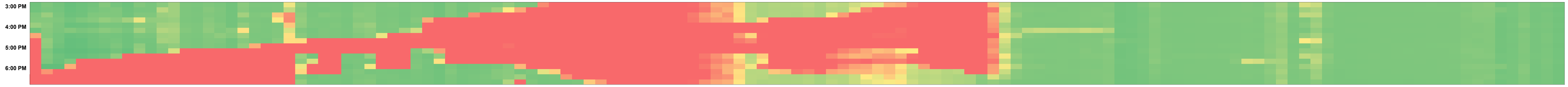
Existing PM - I-270 NB Speed Map



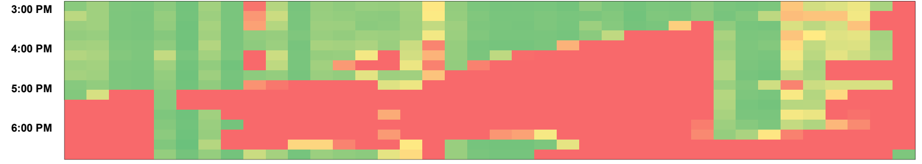
Existing PM - I-270 NB Local Speed Map



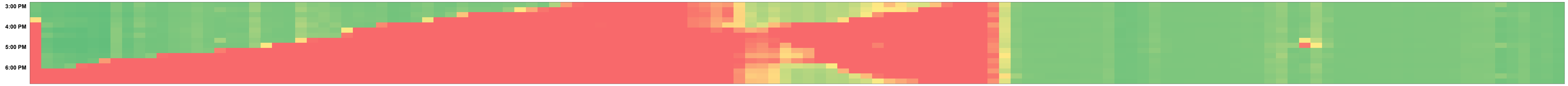
2045 No-Build PM - I-270 NB Speed Map



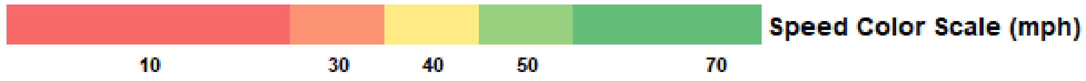
2045 No-Build PM - I-270 NB Local Speed Map



2045 Preferred PM - I-270 NB Speed Map (GP)



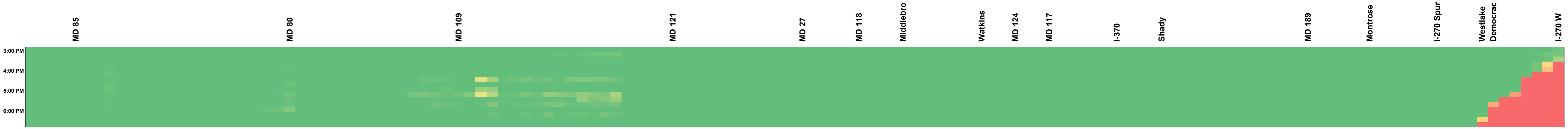
2045 Preferred PM - I-270 NB Speed Map (HOT)



I-270 SB Speed PM

1/27/2022

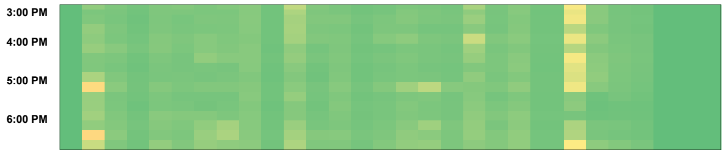
Existing PM - I-270 SB Speed Map



Existing PM - I-270 SB Local Speed Map

2045 No-Build PM - I-270 SB Speed Map

2045 No-Build PM - I-270 SB Local Speed Map



2045 Preferred PM - I-270 SB Speed Map (GP)

2045 Preferred PM - I-270 SB Speed Map (HOT)

🟥 🟧 🟨 🟩 🟩 **Speed Color Scale (mph)**

10 30 40 50 70

Travel Time Matrix - Existing Condition (AM Peak)

Unit: Minute

From	To	I-270 Exit 9	I-270 Exit 8	I-270 Exit 6	I-270 Exit 5	I-270 Exit 4	I-270 Split	Westlake Terr	I-270 Exit 1	I-270 Exit 1B	I-270 Exit 1A	I-495 Exit 44	I-495 Exit 43	I-495 Exit 41	I-495 Exit 40	I-495 Exit 39	I-495 Exit 38	I-495 Exit 36	I-495 Exit 35	I-495 Exit 34	I-495 Exit 33
I-370	I-270 Exit 9	0	3.8	9.7	12.8	16.3	19.8	22.2	23.1	20.3	21.1	31.1	29.9	29.2	27.1	26.2	24.4	N/A	22.5	22.8	24.5
Shady Grove Rd	I-270 Exit 8	0.8	0	6.0	9.1	12.5	16.1	18.4	19.4	16.5	17.3	27.4	26.2	25.4	23.3	22.4	20.6	N/A	18.7	19.1	20.7
MD 28 (W Montgomery Ave)	I-270 Exit 6	2.7	1.8	0	3.1	6.6	10.1	12.5	13.4	10.6	11.3	21.4	20.2	19.4	17.4	16.5	14.7	N/A	12.7	13.1	14.8
MD 189 (Falls Rd)	I-270 Exit 5	3.5	2.7	0.8	0	3.5	7.0	9.4	10.3	7.5	8.2	18.3	17.1	16.3	14.3	13.4	11.6	N/A	9.6	10.0	11.7
Montrose Rd	I-270 Exit 4	4.7	3.9	2.1	1.2	0	3.5	5.9	6.8	4.0	4.7	14.8	13.6	12.8	10.8	9.9	8.1	N/A	6.2	6.5	8.2
Split	I-270	6.0	5.2	3.3	2.5	1.3	0	2.4	3.3	0.5	1.2	11.3	10.1	9.3	7.3	6.4	4.6	N/A	2.6	3.0	4.7
Westlake Terrace	I-270 W Spur	6.9	6.0	4.2	3.3	2.1	0.8	0	0.9	N/A	N/A	8.9	7.7	7.0	4.9	4.0	2.2	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	7.3	6.4	4.6	3.7	2.5	1.2	0.4	0	N/A	N/A	8.0	6.8	6.0	4.0	3.1	1.3	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	6.6	5.8	3.9	3.1	1.9	0.6	N/A	N/A	0	0.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.2	2.5	4.2
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	7.3	6.4	4.6	3.7	2.5	1.2	N/A	N/A	0.7	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.4	1.8	3.4
VA 193 (Georgetown Pike)	I-495 Exit 44	16.2	15.4	13.5	12.7	11.5	10.2	9.3	9.0	N/A	N/A	0	2.9	4.5	6.3	6.7	8.1	10.2	11.0	11.4	13.0
George Washington Memorial Pkwy	I-495 Exit 43	13.3	12.5	10.6	9.8	8.6	7.3	6.4	6.1	N/A	N/A	1.2	0	1.6	3.4	3.8	5.2	7.3	8.1	8.5	10.1
Clara Barton Pkwy	I-495 Exit 41	11.7	10.9	9.0	8.2	7.0	5.7	4.8	4.5	N/A	N/A	2.0	0.8	0	1.8	2.2	3.6	5.7	6.5	6.9	8.5
Cabin John Pkwy	I-495 Exit 40	9.9	9.0	7.2	6.3	5.1	3.8	3.0	2.6	N/A	N/A	4.0	2.8	2.1	0	0.3	1.8	3.8	4.6	5.0	6.7
MD 190 (River Rd)	I-495 Exit 39	9.5	8.7	6.8	6.0	4.8	3.5	2.7	2.3	N/A	N/A	4.9	3.7	3.0	0.9	0	1.5	3.5	4.3	4.7	6.3
I-270 West Spur	I-495 Exit 38	8.1	7.2	5.4	4.6	3.3	2.0	1.2	0.8	N/A	N/A	6.7	5.5	4.8	2.7	1.8	0	2.0	2.8	3.2	4.9
MD 187 (Old Georgetown Rd)	I-495 Exit 36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.7	7.5	6.7	4.7	3.8	2.0	0	0.8	1.2	2.8
I-270 East Spur	I-495 Exit 35	8.6	7.8	5.9	5.1	3.9	2.6	N/A	N/A	2.0	1.3	9.8	8.6	7.8	5.7	4.9	3.0	1.1	0	0.4	2.0
MD 355 (Rockville Pike)	I-495 Exit 34	8.9	8.1	6.2	5.4	4.2	2.9	N/A	N/A	2.3	1.6	10.1	8.9	8.1	6.1	5.2	3.3	1.4	0.3	0	1.6
MD 185 (Connecticut Ave)	I-495 Exit 33	10.6	9.8	7.9	7.1	5.9	4.6	N/A	N/A	4.0	3.4	11.8	10.6	9.8	7.8	6.9	5.1	3.1	2.0	1.7	0
MD 97 (Georgia Ave)	I-495 Exit 31	14.3	13.5	11.7	10.8	9.6	8.3	N/A	N/A	7.7	7.1	15.5	14.3	13.5	11.5	10.6	8.8	6.8	5.7	5.4	3.7
US 29 (Colesville Rd)	I-495 Exit 30	17.5	16.7	14.8	14.0	12.8	11.5	N/A	N/A	10.9	10.2	18.7	17.5	16.7	14.6	13.7	11.9	10.0	8.9	8.6	6.9
MD 193 (University Blvd E)	I-495 Exit 29	19.9	19.1	17.3	16.4	15.2	13.9	N/A	N/A	13.3	12.7	21.1	19.9	19.1	17.1	16.2	14.4	12.4	11.3	11.0	9.3
MD 650 (New Hampshire Ave)	I-495 Exit 28	29.3	28.5	26.7	25.8	24.6	23.3	N/A	N/A	22.7	22.1	30.5	29.3	28.5	26.5	25.6	23.8	21.8	20.7	20.4	18.7
I-95	I-495 Exit 27	32.5	31.6	29.8	28.9	27.7	26.4	N/A	N/A	25.9	25.2	33.6	32.4	31.7	29.6	28.7	26.9	24.9	23.9	23.5	21.8
US 1 (Baltimore Ave)	I-495 Exit 25	33.5	32.7	30.8	30.0	28.8	27.5	N/A	N/A	26.9	26.3	34.7	33.5	32.7	30.7	29.8	28.0	26.0	24.9	24.6	22.9
Greenbelt Metro Station	I-495 Exit 24	34.5	33.6	31.8	31.0	29.7	28.4	N/A	N/A	27.9	27.2	35.7	34.5	33.7	31.6	30.7	28.9	26.9	25.9	25.6	23.9
MD 201 (Kenilworth Ave)	I-495 Exit 23	35.9	35.1	33.2	32.4	31.2	29.9	N/A	N/A	29.3	28.6	37.1	35.9	35.1	33.0	32.1	30.3	28.4	27.3	27.0	25.3
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	37.0	36.2	34.3	33.5	32.3	31.0	N/A	N/A	30.4	29.8	38.2	37.0	36.2	34.2	33.3	31.5	29.5	28.4	28.1	26.4
MD 450 (Annapolis Rd)	I-495 Exit 20	40.2	39.3	37.5	36.6	35.4	34.1	N/A	N/A	33.6	32.9	41.3	40.1	39.4	37.3	36.4	34.6	32.6	31.6	31.3	29.5
US 50 (John Hanson Hwy)	I-495 Exit 19	42.1	41.3	39.5	38.6	37.4	36.1	N/A	N/A	35.5	34.9	43.3	42.1	41.3	39.3	38.4	36.6	34.6	33.5	33.2	31.5
MD 202 (Landover Rd)	I-495 Exit 17	45.5	44.6	42.8	41.9	40.7	39.4	N/A	N/A	38.9	38.2	46.6	45.4	44.7	42.6	41.7	39.9	37.9	36.9	36.5	34.8
Arena Dr	I-495 Exit 16	46.4	45.6	43.7	42.9	41.7	40.4	N/A	N/A	39.8	39.1	47.6	46.4	45.6	43.5	42.6	40.8	38.9	37.8	37.5	35.8
MD 214 (Central Ave)	I-495 Exit 15	47.6	46.7	44.9	44.0	42.8	41.5	N/A	N/A	41.0	40.3	48.7	47.5	46.8	44.7	43.8	42.0	40.0	39.0	38.6	36.9
Ritchie-Marlboro Rd	I-495 Exit 13	49.4	48.5	46.7	45.9	44.6	43.3	N/A	N/A	42.8	42.1	50.6	49.4	48.6	46.5	45.6	43.8	41.8	40.8	40.5	38.8
MD 4 (Pennsylvania Ave)	I-495 Exit 11	52.1	51.2	49.4	48.5	47.3	46.0	N/A	N/A	45.5	44.8	53.2	52.0	51.3	49.2	48.3	46.5	44.5	43.4	43.1	41.4
MD 337 (Suitland Pkwy)	I-495 Exit 9	53.4	52.6	50.7	49.9	48.7	47.4	N/A	N/A	46.8	46.2	54.6	53.4	52.6	50.6	49.7	47.9	45.9	44.8	44.5	42.8
MD 5 (Branch Ave)	I-495 Exit 7	55.6	54.8	53.0	52.1	50.9	49.6	N/A	N/A	49.0	48.4	56.8	55.6	54.8	52.8	51.9	50.1	48.1	47.0	46.7	45.0
MD 414 (St Barnabas Rd)	I-495 Exit 4	58.7	57.8	56.0	55.2	53.9	52.6	N/A	N/A	52.1	51.4	59.8	58.6	57.9	55.8	54.9	53.1	51.1	50.1	49.8	48.0

Unit: Minute

From	To	I-495 Exit 31	I-495 Exit 30	I-495 Exit 29	I-495 Exit 28	I-495 Exit 27	I-495 Exit 25	I-495 Exit 24	I-495 Exit 23	I-495 Exit 22	I-495 Exit 20	I-495 Exit 19	I-495 Exit 17	I-495 Exit 16	I-495 Exit 15	I-495 Exit 13	I-495 Exit 11	I-495 Exit 9	I-495 Exit 7	I-495 Exit 4
I-370	I-270 Exit 9	26.7	28.2	28.9	30.7	32.3	33.5	34.7	36.4	37.4	39.9	41.4	43.5	44.2	45.4	47.2	49.8	51.0	53.0	55.5
Shady Grove Rd	I-270 Exit 8	23.0	24.4	25.2	26.9	28.5	29.7	31.0	32.6	33.7	36.1	37.6	39.7	40.4	41.7	43.4	46.1	47.2	49.3	51.7
MD 28 (W Montgomery Ave)	I-270 Exit 6	17.0	18.5	19.2	21.0	22.6	23.8	25.0	26.7	27.7	30.2	31.6	33.8	34.5	35.7	37.5	40.1	41.3	43.3	45.8
MD 189 (Falls Rd)	I-270 Exit 5	13.9	15.4	16.1	17.9	19.5	20.6	21.9	23.6	24.6	27.1	28.5	30.7	31.4	32.6	34.4	37.0	38.1	40.2	42.6
Montrose Rd	I-270 Exit 4	10.4	11.9	12.6	14.4	16.0	17.2	18.4	20.1	21.1	23.6	25.1	27.2	27.9	29.1	30.9	33.5	34.7	36.7	39.2
Split	I-270	6.9	8.4	9.1	10.9	12.5	13.7	14.9	16.6	17.6	20.1	21.5	23.7	24.4	25.6	27.4	30.0	31.1	33.2	35.7
Westlake Terrace	I-270 W Spur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	6.4	7.9	8.6	10.4	12.0	13.2	14.4	16.1	17.1	19.6	21.1	23.2	23.9	25.1	26.9	29.5	30.7	32.7	35.2
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	5.7	7.2	7.9	9.7	11.3	12.4	13.7	15.3	16.4	18.8	20.3	22.5	23.2	24.4	26.2	28.8	29.9	32.0	34.4
VA 193 (Georgetown Pike)	I-495 Exit 44	15.2	16.7	17.4	19.2	20.8	22.0	23.2	24.9	25.9	28.4	29.9	32.0	32.7	33.9	35.7	38.4	39.5	41.5	44.0
George Washington Memorial Pkwy	I-495 Exit 43	12.3	13.8	14.5	16.3	17.9	19.1	20.3	22.0	23.0	25.5	27.0	29.1	29.8	31.0	32.8	35.5	36.6	38.6	41.1
Clara Barton Pkwy	I-495 Exit 41	10.7	12.2	12.9	14.7	16.3	17.5	18.7	20.4	21.4	23.9	25.4	27.5	28.2	29.4	31.2	33.9	35.0	37.0	39.5
Cabin John Pkwy	I-495 Exit 40	8.9	10.4	11.1	12.9	14.5	15.6	16.9	18.6	19.6	22.1	23.5	25.7	26.4	27.6	29.4	32.0	33.1	35.2	37.6
MD 190 (River Rd)	I-495 Exit 39	8.6	10.0	10.8	12.5	14.1	15.3	16.6	18.2	19.3	21.7	23.2	25.3	26.0	27.3	29.0	31.7	32.8	34.9	37.3
I-270 West Spur	I-495 Exit 38	7.1	8.6	9.3	11.1	12.7	13.9	15.1	16.8	17.8	20.3	21.7	23.9	24.6	25.8	27.6	30.2	31.3	33.4	35.9
MD 187 (Old Georgetown Rd)	I-495 Exit 36	5.1	6.5	7.3	9.0	10.6	11.8	13.1	14.7	15.8	18.2	19.7	21.8	22.5	23.8	25.5	28.2	29.3	31.4	33.8
I-270 East Spur	I-495 Exit 35	4.3	5.7	6.5	8.2	9.8	11.0	12.3	13.9	15.0	17.4	18.9	21.0	21.7	23.0	24.7	27.4	28.5	30.6	33.0
MD 355 (Rockville Pike)	I-495 Exit 34	3.9	5.4	6.1	7.9	9.5	10.6	11.9	13.6	14.6	17.1	18.5	20.7	21.4	22.6	24.4	27.0	28.1	30.2	32.6
MD 185 (Connecticut Ave)	I-495 Exit 33	2.2	3.7	4.4	6.2	7.8	9.0	10.2	11.9	12.9	15.4	16.9	19.0	19.7	20.9	22.7	25.4	26.5	28.5	31.0
MD 97 (Georgia Ave)	I-495 Exit 31	0	1.5	2.2	4.0	5.6	6.8	8.0	9.7	10.7	13.2	14.6	16.8	17.5	18.7	20.5	23.1	24.2	26.3	28.8
US 29 (Colesville Rd)	I-495 Exit 30	4.8	0	0.7	2.5	4.1	5.3	6.5	8.2	9.2	11.7	13.2	15.3	16.0	17.2	19.0	21.6	22.8	24.8	27.3
MD 193 (University Blvd E)	I-495 Exit 29	7.2	3.0	0	1.8	3.4	4.6	5.8	7.5	8.5	11.0	12.4	14.6	15.3	16.5	18.3	20.9	22.0	24.1	26.6
MD 650 (New Hampshire Ave)	I-495 Exit 28	16.6	12.4	7.9	0	1.6	2.8	4.0	5.7	6.7	9.2	10.7	12.8	13.5	14.7	16.5	19.1	20.3	22.3	24.8
I-95	I-495 Exit 27	19.7	15.5	11.0	7.6	0	1.2	2.4	4.1	5.1	7.6	9.1	11.2	11.9	13.1	14.9	17.5	18.7	20.7	23.2
US 1 (Baltimore Ave)	I-495 Exit 25	20.8	16.6	12.1	8.7	1.1	0	1.2	2.9	3.9	6.4	7.9	10.0	10.7	11.9	13.7	16.4	17.5	19.5	22.0
Greenbelt Metro Station	I-495 Exit 24	21.7	17.5	13.0	9.6	2.0	1.0	0	1.7	2.7	5.2	6.6	8.8	9.5	10.7	12.5	15.1	16.2	18.3	20.8
MD 201 (Kenilworth Ave)	I-495 Exit 23	23.2	18.9	14.4	11.1	3.4	2.4	1.4	0	1.0	3.5	5.0	7.1	7.8	9.0	10.8	13.4	14.6	16.6	19.1
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	24.3	20.1	15.5	12.2	4.6	3.5	2.5	1.1	0	2.5	3.9	6.1	6.8	8.0	9.8	12.4	13.5	15.6	18.1
MD 450 (Annapolis Rd)	I-495 Exit 20	27.4	23.2	18.7	15.3	7.7	6.6	5.7	4.3	3.1	0	1.5	3.6	4.3	5.5	7.3	9.9	11.1	13.1	15.6
US 50 (John Hanson Hwy)	I-495 Exit 19	29.4	25.2	20.7	17.3	9.7	8.6	7.7	6.2	5.1	2.0	0	2.1	2.8	4.1	5.8	8.5	9.6	11.7	14.1
MD 202 (Landover Rd)	I-495 Exit 17	32.7	28.5	24.0	20.6	13.0	11.9	11.0	9.6	8.4	5.3	3.3	0	0.7	1.9	3.7	6.3	7.5	9.5	12.0
Arena Dr	I-495 Exit 16	33.7	29.4	24.9	21.6	13.9	12.9	11.9	10.5	9.4	6.2	4.3	0.9	0	1.2	3.0	5.6	6.8	8.8	11.3
MD 214 (Central Ave)	I-495 Exit 15	34.8	30.6	26.1	22.7	15.1	14.0	13.1	11.7	10.5	7.4	5.4	2.1	1.2	0	1.8	4.4	5.5	7.6	10.1
Ritchie-Marlboro Rd	I-495 Exit 13	36.6	32.4	27.9	24.5	16.9	15.8	14.9	13.5	12.4	9.2	7.2	3.9	3.0	1.8	0	2.6	3.8	5.8	8.3
MD 4 (Pennsylvania Ave)	I-495 Exit 11	39.3	35.1	30.6	27.2	19.6	18.5	17.6	16.2	15.0	11.9	9.9	6.6	5.7	4.5	2.7	0	1.1	3.2	5.6
MD 337 (Suitland Pkwy)	I-495 Exit 9	40.7	36.5	32.0	28.6	21.0	19.9	18.9	17.5	16.4	13.3	11.3	8.0	7.0	5.9	4.1	1.4	0	2.0	4.5
MD 5 (Branch Ave)	I-495 Exit 7	42.9	38.7	34.2	30.8	23.2	22.1	21.2	19.7	18.6	15.5	13.5	10.2	9.2	8.1	6.3	3.6	2.2	0	2.5
MD 414 (St Barnabas Rd)	I-495 Exit 4	45.9	41.7	37.2	33.8	26.2	25.1	24.2	22.8	21.6	18.5	16.5	13.2	12.3	11.1	9.3	6.6	5.2	3.0	0

Travel Time Matrix - 2045 No Build (AM Peak)

Unit: Minute

From	T	I-270 Exit 9	I-270 Exit 8	I-270 Exit 6	I-270 Exit 5	I-270 Exit 4	I-270 Split	Westlake Terr	I-270 Exit 1	I-270 Exit 1B	I-270 Exit 1A	I-495 Exit 44	I-495 Exit 43	I-495 Exit 41	I-495 Exit 40	I-495 Exit 39	I-495 Exit 38	I-495 Exit 36	I-495 Exit 35	I-495 Exit 34	I-495 Exit 33
I-370	I-270 Exit 9	0	1.1	3.4	4.5	5.8	8.1	9.0	9.5	8.6	9.4	18.6	17.3	16.5	14.3	13.0	10.4	N/A	10.8	11.2	13.0
Shady Grove Rd	I-270 Exit 8	0.9	0	2.3	3.4	4.7	7.1	7.9	8.5	7.5	8.3	17.5	16.3	15.5	13.3	11.9	9.4	N/A	9.8	10.1	12.0
MD 28 (W Montgomery Ave)	I-270 Exit 6	2.7	1.8	0	1.1	2.4	4.8	5.6	6.2	5.2	6.0	15.2	13.9	13.2	10.9	9.6	7.1	N/A	7.5	7.8	9.7
MD 189 (Falls Rd)	I-270 Exit 5	3.5	2.7	0.8	0	1.3	3.6	4.5	5.0	4.1	4.9	14.1	12.8	12.0	9.8	8.5	5.9	N/A	6.3	6.7	8.5
Montrose Rd	I-270 Exit 4	4.7	3.9	2.0	1.2	0	2.4	3.2	3.7	2.8	3.6	12.8	11.5	10.8	8.5	7.2	4.7	N/A	5.0	5.4	7.2
Split	I-270	6.0	5.2	3.3	2.5	1.3	0	0.9	1.4	0.5	1.2	10.4	9.2	8.4	6.2	4.8	2.3	N/A	2.7	3.1	4.9
Westlake Terrace	I-270 W Spur	6.8	6.0	4.1	3.3	2.1	0.8	0	0.5	N/A	N/A	9.6	8.3	7.5	5.3	4.0	1.5	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	7.2	6.4	4.5	3.7	2.5	1.2	0.4	0	N/A	N/A	9.0	7.8	7.0	4.8	3.4	0.9	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	6.6	5.7	3.9	3.1	1.8	0.6	N/A	N/A	0	0.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.2	2.6	4.4
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	7.3	6.4	4.6	3.7	2.5	1.2	N/A	N/A	0.7	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.5	1.8	3.7
VA 193 (Georgetown Pike)	I-495 Exit 44	16.5	15.7	13.8	13.0	11.8	10.5	9.7	9.3	N/A	N/A	0	3.3	4.8	6.7	7.0	8.5	10.5	11.3	11.6	13.5
George Washington Memorial Pkwy	I-495 Exit 43	13.2	12.4	10.5	9.7	8.5	7.2	6.4	6.0	N/A	N/A	1.3	0	1.5	3.4	3.7	5.2	7.2	8.0	8.3	10.2
Clara Barton Pkwy	I-495 Exit 41	11.7	10.9	9.0	8.2	7.0	5.7	4.9	4.5	N/A	N/A	2.0	0.8	0	1.9	2.2	3.6	5.7	6.4	6.8	8.6
Cabin John Pkwy	I-495 Exit 40	9.9	9.0	7.2	6.3	5.1	3.8	3.0	2.6	N/A	N/A	4.3	3.0	2.2	0	0.3	1.8	3.8	4.6	5.0	6.8
MD 190 (River Rd)	I-495 Exit 39	9.5	8.7	6.8	6.0	4.8	3.5	2.7	2.3	N/A	N/A	5.6	4.4	3.6	1.4	0	1.5	3.5	4.3	4.6	6.5
I-270 West Spur	I-495 Exit 38	8.1	7.2	5.4	4.5	3.3	2.0	1.2	0.8	N/A	N/A	8.1	6.9	6.1	3.9	2.5	0	2.0	2.8	3.2	5.0
MD 187 (Old Georgetown Rd)	I-495 Exit 36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	16.7	15.5	14.7	12.5	11.1	8.6	0	0.8	1.2	3.0
I-270 East Spur	I-495 Exit 35	8.6	7.8	5.9	5.1	3.9	2.6	N/A	N/A	2.0	1.3	19.2	17.9	17.2	14.9	13.6	11.1	2.5	0	0.4	2.2
MD 355 (Rockville Pike)	I-495 Exit 34	8.9	8.1	6.2	5.4	4.2	2.9	N/A	N/A	2.3	1.7	19.5	18.2	17.5	15.2	13.9	11.4	2.8	0.3	0	1.8
MD 185 (Connecticut Ave)	I-495 Exit 33	10.6	9.8	7.9	7.1	5.9	4.6	N/A	N/A	4.0	3.4	21.2	19.9	19.2	16.9	15.6	13.1	4.5	2.0	1.7	0
MD 97 (Georgia Ave)	I-495 Exit 31	14.3	13.5	11.6	10.8	9.6	8.3	N/A	N/A	7.8	7.1	24.9	23.7	22.9	20.7	19.3	16.8	8.2	5.7	5.4	3.7
US 29 (Colesville Rd)	I-495 Exit 30	17.5	16.6	14.8	14.0	12.8	11.5	N/A	N/A	10.9	10.2	28.1	26.8	26.1	23.8	22.5	20.0	11.4	8.9	8.6	6.9
MD 193 (University Blvd E)	I-495 Exit 29	19.9	19.1	17.2	16.4	15.2	13.9	N/A	N/A	13.4	12.7	30.5	29.3	28.5	26.3	24.9	22.4	13.8	11.3	11.0	9.3
MD 650 (New Hampshire Ave)	I-495 Exit 28	29.6	28.8	26.9	26.1	24.9	23.6	N/A	N/A	23.0	22.4	40.2	38.9	38.2	35.9	34.6	32.1	23.5	21.0	20.7	19.0
I-95	I-495 Exit 27	36.1	35.2	33.4	32.5	31.3	30.0	N/A	N/A	29.5	28.8	46.7	45.4	44.6	42.4	41.0	38.5	29.9	27.5	27.2	25.4
US 1 (Baltimore Ave)	I-495 Exit 25	41.2	40.4	38.5	37.7	36.5	35.2	N/A	N/A	34.6	34.0	51.8	50.6	49.8	47.5	46.2	43.7	35.1	32.6	32.3	30.6
Greenbelt Metro Station	I-495 Exit 24	42.2	41.3	39.5	38.7	37.5	36.2	N/A	N/A	35.6	34.9	52.8	51.5	50.8	48.5	47.2	44.7	36.1	33.6	33.3	31.6
MD 201 (Kenilworth Ave)	I-495 Exit 23	44.5	43.7	41.8	41.0	39.8	38.5	N/A	N/A	37.9	37.3	55.1	53.9	53.1	50.9	49.5	47.0	38.4	35.9	35.6	33.9
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	46.1	45.2	43.4	42.5	41.3	40.1	N/A	N/A	39.5	38.8	56.7	55.4	54.6	52.4	51.0	48.5	39.9	37.5	37.2	35.5
MD 450 (Annapolis Rd)	I-495 Exit 20	49.3	48.4	46.6	45.7	44.5	43.3	N/A	N/A	42.7	42.0	59.9	58.6	57.8	55.6	54.2	51.7	43.1	40.7	40.4	38.6
US 50 (John Hanson Hwy)	I-495 Exit 19	51.3	50.4	48.6	47.8	46.5	45.3	N/A	N/A	44.7	44.0	61.9	60.6	59.8	57.6	56.3	53.7	45.1	42.7	42.4	40.7
MD 202 (Landover Rd)	I-495 Exit 17	56.7	55.8	54.0	53.2	51.9	50.7	N/A	N/A	50.1	49.4	67.3	66.0	65.2	63.0	61.7	59.1	50.5	48.1	47.8	46.1
Arena Dr	I-495 Exit 16	59.1	58.2	56.4	55.6	54.4	53.1	N/A	N/A	52.5	51.8	69.7	68.4	67.7	65.4	64.1	61.6	53.0	50.5	50.2	48.5
MD 214 (Central Ave)	I-495 Exit 15	63.7	62.8	61.0	60.1	58.9	57.6	N/A	N/A	57.1	56.4	74.3	73.0	72.2	70.0	68.6	66.1	57.5	55.1	54.8	53.0
Ritchie-Marlboro Rd	I-495 Exit 13	70.7	69.9	68.0	67.2	66.0	64.7	N/A	N/A	64.1	63.5	81.3	80.0	79.3	77.0	75.7	73.2	64.6	62.1	61.8	60.1
MD 4 (Pennsylvania Ave)	I-495 Exit 11	82.1	81.3	79.4	78.6	77.4	76.1	N/A	N/A	75.5	74.9	92.7	91.4	90.7	88.4	87.1	84.6	76.0	73.5	73.2	71.5
MD 337 (Suitland Pkwy)	I-495 Exit 9	83.7	82.8	81.0	80.2	79.0	77.7	N/A	N/A	77.1	76.4	94.3	93.0	92.3	90.0	88.7	86.2	77.6	75.1	74.8	73.1
MD 5 (Branch Ave)	I-495 Exit 7	86.1	85.3	83.4	82.6	81.4	80.1	N/A	N/A	79.5	78.9	96.7	95.4	94.7	92.4	91.1	88.6	80.0	77.5	77.2	75.5
MD 414 (St Barnabas Rd)	I-495 Exit 4	90.3	89.4	87.6	86.7	85.5	84.2	N/A	N/A	83.7	83.0	100.8	99.6	98.8	96.6	95.2	92.7	84.1	81.7	81.3	79.6

Unit: Minute

From	T	I-495 Exit 31	I-495 Exit 30	I-495 Exit 29	I-495 Exit 28	I-495 Exit 27	I-495 Exit 25	I-495 Exit 24	I-495 Exit 23	I-495 Exit 22	I-495 Exit 20	I-495 Exit 19	I-495 Exit 17	I-495 Exit 16	I-495 Exit 15	I-495 Exit 13	I-495 Exit 11	I-495 Exit 9	I-495 Exit 7	I-495 Exit 4
I-370	I-270 Exit 9	15.3	16.7	17.5	19.3	20.9	21.9	23.0	24.5	25.5	27.8	29.2	31.3	31.9	33.1	34.8	37.4	40.9	56.7	84.1
Shady Grove Rd	I-270 Exit 8	14.2	15.7	16.4	18.2	19.8	20.9	21.9	23.5	24.4	26.8	28.2	30.2	30.9	32.0	33.7	36.3	39.8	55.6	83.1
MD 28 (W Montgomery Ave)	I-270 Exit 6	11.9	13.4	14.1	15.9	17.5	18.6	19.6	21.1	22.1	24.5	25.9	27.9	28.6	29.7	31.4	34.0	37.5	53.3	80.8
MD 189 (Falls Rd)	I-270 Exit 5	10.8	12.3	13.0	14.8	16.4	17.4	18.5	20.0	21.0	23.3	24.7	26.8	27.4	28.6	30.3	32.9	36.4	52.2	79.6
Montrose Rd	I-270 Exit 4	9.5	11.0	11.7	13.5	15.1	16.2	17.2	18.7	19.7	22.1	23.5	25.5	26.2	27.3	29.0	31.6	35.1	50.9	78.4
Split	I-270	7.1	8.6	9.3	11.2	12.7	13.8	14.9	16.4	17.4	19.7	21.1	23.1	23.8	25.0	26.7	29.2	32.8	48.6	76.0
Westlake Terrace	I-270 W Spur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	6.7	8.1	8.9	10.7	12.3	13.3	14.4	15.9	16.9	19.2	20.6	22.7	23.3	24.5	26.2	28.8	32.3	48.1	75.5
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	5.9	7.4	8.1	9.9	11.5	12.6	13.6	15.1	16.1	18.5	19.9	21.9	22.6	23.7	25.4	28.0	31.5	47.3	74.8
VA 193 (Georgetown Pike)	I-495 Exit 44	15.7	17.2	17.9	19.7	21.3	22.4	23.4	24.9	25.9	28.3	29.7	31.7	32.4	33.5	35.2	37.8	41.3	57.1	84.6
George Washington Memorial Pkwy	I-495 Exit 43	12.4	13.9	14.6	16.4	18.0	19.1	20.1	21.6	22.6	25.0	26.4	28.4	29.1	30.2	31.9	34.5	38.0	53.8	81.3
Clara Barton Pkwy	I-495 Exit 41	10.9	12.4	13.1	14.9	16.5	17.5	18.6	20.1	21.1	23.4	24.8	26.9	27.6	28.7	30.4	33.0	36.5	52.3	79.7
Cabin John Pkwy	I-495 Exit 40	9.0	10.5	11.2	13.0	14.6	15.7	16.7	18.3	19.2	21.6	23.0	25.0	25.7	26.8	28.6	31.1	34.6	50.5	77.9
MD 190 (River Rd)	I-495 Exit 39	8.7	10.2	10.9	12.7	14.3	15.4	16.4	17.9	18.9	21.3	22.7	24.7	25.4	26.5	28.2	30.8	34.3	50.1	77.6
I-270 West Spur	I-495 Exit 38	7.2	8.7	9.4	11.3	12.9	13.9	15.0	16.5	17.5	19.8	21.2	23.2	23.9	25.1	26.8	29.3	32.9	48.7	76.1
MD 187 (Old Georgetown Rd)	I-495 Exit 36	5.2	6.7	7.4	9.2	10.8	11.9	12.9	14.5	15.4	17.8	19.2	21.2	21.9	23.1	24.8	27.3	30.8	46.7	74.1
I-270 East Spur	I-495 Exit 35	4.4	5.9	6.6	8.5	10.1	11.1	12.2	13.7	14.7	17.0	18.4	20.4	21.1	22.3	24.0	26.5	30.1	45.9	73.3
MD 355 (Rockville Pike)	I-495 Exit 34	4.1	5.5	6.3	8.1	9.7	10.7	11.8	13.3	14.3	16.6	18.0	20.1	20.7	21.9	23.6	26.2	29.7	45.5	72.9
MD 185 (Connecticut Ave)	I-495 Exit 33	2.2	3.7	4.4	6.3	7.9	8.9	10.0	11.5	12.5	14.8	16.2	18.2	18.9	20.1	21.8	24.3	27.9	43.7	71.1
MD 97 (Georgia Ave)	I-495 Exit 31	0	1.5	2.2	4.0	5.6	6.7	7.7	9.2	10.2	12.6	14.0	16.0	16.7	17.8	19.5	22.1	25.6	41.4	68.9
US 29 (Colesville Rd)	I-495 Exit 30	4.8	0	0.7	2.5	4.1	5.2	6.2	7.8	8.7	11.1	12.5	14.5	15.2	16.3	18.0	20.6	24.1	39.9	67.4
MD 193 (University Blvd E)	I-495 Exit 29	7.2	3.0	0	1.8	3.4	4.5	5.5	7.0	8.0	10.4	11.8	13.8	14.5	15.6	17.3	19.9	23.4	39.2	66.7
MD 650 (New Hampshire Ave)	I-495 Exit 28	16.9	12.7	8.1	0	1.6	2.6	3.7	5.2	6.2	8.5	9.9	12.0	12.7	13.8	15.5	18.1	21.6	37.4	64.9
I-95	I-495 Exit 27	23.3	19.2	14.6	11.1	0	1.1	2.1	3.6	4.6	7.0	8.4	10.4	11.1	12.2	13.9	16.5	20.0	35.8	63.3
US 1 (Baltimore Ave)	I-495 Exit 25	28.5	24.3	19.7	16.3	5.2	0	1.1	2.6	3.5	5.9	7.3	9.3	10.0	11.2	12.9	15.4	19.0	34.8	62.2
Greenbelt Metro Station	I-495 Exit 24	29.5	25.3	20.7	17.3	6.1	1.0	0	1.5	2.5	4.8	6.2	8.3	9.0	10.1	11.8	14.4	17.9	33.7	61.1
MD 201 (Kenilworth Ave)	I-495 Exit 23	31.8	27.6	23.0	19.6	8.5	3.3	2.3	0	1.0	3.3	4.7	6.8	7.4	8.6	10.3	12.9	16.4	32.2	59.6
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	33.3	29.2	24.6	21.1	10.0	4.9	3.9	1.5	0	2.3	3.7	5.8	6.5	7.6	9.3	11.9	15.4	31.2	58.7
MD 450 (Annapolis Rd)	I-495 Exit 20	36.5	32.4	27.8	24.3	13.2	8.0	7.1	4.7	3.2	0	1.4	3.4	4.1	5.3	7.0	9.5	13.1	28.9	56.3
US 50 (John Hanson Hwy)	I-495 Exit 19	38.6	34.4	29.8	26.3	15.2	10.1	9.1	6.8	5.2	2.0	0	2.0	2.7	3.9	5.6	8.1	11.7	27.5	54.9
MD 202 (Landover Rd)	I-495 Exit 17	43.9	39.8	35.2	31.7	20.6	15.5	14.5	12.1	10.6	7.4	5.4	0	0.7	1.8	3.5	6.1	9.6	25.4	52.9
Arena Dr	I-495 Exit 16	46.4	42.2	37.6	34.2	23.0	17.9	16.9	14.6	13.0	9.8	7.8	2.4	0	1.1	2.9	5.4	8.9	24.8	52.2
MD 214 (Central Ave)	I-495 Exit 15	50.9	46.8	42.2	38.7	27.6	22.4	21.5	19.1	17.6	14.4	12.4	7.0	4.6	0	1.7	4.3	7.8	23.6	51.0
Ritchie-Marlboro Rd	I-495 Exit 13	58.0	53.8	49.2	45.8	34.6	29.5	28.5	26.2	24.6	21.4	19.4	14.0	11.6	7.0	0	2.6	6.1	21.9	49.3
MD 4 (Pennsylvania Ave)	I-495 Exit 11	69.4	65.2	60.6	57.2	46.1	40.9	39.9	37.6	36.0	32.8	30.8	25.4	23.0	18.5	11.4	0	3.5	19.3	46.8
MD 337 (Suitland Pkwy)	I-495 Exit 9	71.0	66.8	62.2	58.8	47.6	42.5	41.5	39.2	37.6	34.4	32.4	27.0	24.6	20.0	13.0	1.6	0	15.8	43.3
MD 5 (Branch Ave)	I-495 Exit 7	73.4	69.2	64.6	61.2	50.0	44.9	43.9	41.6	40.0	36.8	34.8	29.4	27.0	22.4	15.4	4.0	2.4	0	27.4
MD 414 (St Barnabas Rd)	I-495 Exit 4	77.5	73.4	68.8	65.3	54.2	49.0	48.1	45.7	44.2	41.0	39.0	33.6	31.2	26.6	19.5	8.1	6.6	4.1	0

Travel Time Matrix - Alternative 9 Phase 1 - GP Lane (AM Peak)

Unit: Minute

From	T	I-270 Exit 9	I-270 Exit 8	I-270 Exit 6	I-270 Exit 5	I-270 Exit 4	I-270 Split	Westlake Terr	I-270 Exit 1	I-270 Exit 1B	I-270 Exit 1A	I-495 Exit 44	I-495 Exit 43	I-495 Exit 41	I-495 Exit 40	I-495 Exit 39	I-495 Exit 38	I-495 Exit 36	I-495 Exit 35	I-495 Exit 34	I-495 Exit 33
I-370	I-270 Exit 9	0	1.0	3.3	4.5	6.2	9.1	9.9	10.4	9.5	10.3	17.4	16.1	15.3	13.6	13.0	11.3	N/A	11.8	12.6	15.0
Shady Grove Rd	I-270 Exit 8	0.9	0	2.3	3.4	5.1	8.1	8.9	9.4	8.5	9.2	16.3	15.1	14.3	12.6	12.0	10.3	N/A	10.8	11.5	14.0
MD 28 (W Montgomery Ave)	I-270 Exit 6	2.9	2.0	0	1.1	2.8	5.8	6.6	7.1	6.2	6.9	14.0	12.8	12.0	10.3	9.7	8.0	N/A	8.5	9.2	11.7
MD 189 (Falls Rd)	I-270 Exit 5	3.8	2.8	0.9	0	1.7	4.6	5.4	5.9	5.0	5.8	12.9	11.6	10.8	9.2	8.5	6.8	N/A	7.3	8.1	10.5
Montrose Rd	I-270 Exit 4	5.0	4.1	2.2	1.3	0	2.9	3.7	4.3	3.4	4.1	11.2	10.0	9.1	7.5	6.8	5.1	N/A	5.6	6.4	8.9
Split	I-270	6.4	5.4	3.5	2.6	1.3	0	0.8	1.3	0.4	1.2	8.3	7.0	6.2	4.5	3.9	2.2	N/A	2.7	3.5	5.9
Westlake Terrace	I-270 W Spur	7.1	6.2	4.2	3.4	2.1	0.8	0	0.5	N/A	N/A	7.5	6.2	5.4	3.7	3.1	1.4	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	7.5	6.6	4.6	3.8	2.5	1.1	0.4	0	N/A	N/A	6.9	5.7	4.9	3.2	2.6	0.9	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	6.9	5.9	4.0	3.1	1.8	0.5	N/A	N/A	0	0.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.3	3.0	5.5
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	7.5	6.6	4.6	3.8	2.5	1.2	N/A	N/A	0.7	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.5	2.3	4.7
VA 193 (Georgetown Pike)	I-495 Exit 44	14.2	13.3	11.4	10.5	9.2	7.9	7.1	6.7	N/A	N/A	0	1.3	2.2	4.1	4.4	5.9	8.3	9.7	10.5	12.9
George Washington Memorial Pkwy	I-495 Exit 43	12.9	12.0	10.1	9.2	7.9	6.6	5.8	5.4	N/A	N/A	1.2	0	0.9	2.8	3.1	4.6	7.0	8.4	9.2	11.6
Clara Barton Pkwy	I-495 Exit 41	12.1	11.1	9.2	8.3	7.0	5.7	4.9	4.5	N/A	N/A	2.1	0.8	0	1.9	2.2	3.7	6.1	7.5	8.3	10.8
Cabin John Pkwy	I-495 Exit 40	10.2	9.3	7.3	6.4	5.2	3.8	3.1	2.7	N/A	N/A	3.7	2.5	1.7	0	0.3	1.8	4.2	5.7	6.4	8.9
MD 190 (River Rd)	I-495 Exit 39	9.8	8.9	7.0	6.1	4.8	3.5	2.7	2.3	N/A	N/A	4.4	3.1	2.3	0.6	0	1.5	3.9	5.3	6.1	8.5
I-270 West Spur	I-495 Exit 38	8.4	7.4	5.5	4.6	3.3	2.0	1.2	0.8	N/A	N/A	6.1	4.8	4.0	2.3	1.7	0	2.4	3.8	4.6	7.1
MD 187 (Old Georgetown Rd)	I-495 Exit 36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.1	6.8	6.0	4.3	3.7	2.0	0	1.5	2.2	4.7
I-270 East Spur	I-495 Exit 35	8.9	8.0	6.0	5.1	3.8	2.5	N/A	N/A	2.0	1.4	9.1	7.9	7.0	5.4	4.8	3.1	1.1	0	0.7	3.2
MD 355 (Rockville Pike)	I-495 Exit 34	9.2	8.3	6.3	5.4	4.2	2.8	N/A	N/A	2.3	1.7	9.4	8.2	7.3	5.7	5.1	3.4	1.4	0.3	0	2.5
MD 185 (Connecticut Ave)	I-495 Exit 33	10.9	10.0	8.0	7.2	5.9	4.6	N/A	N/A	4.1	3.4	11.2	9.9	9.1	7.4	6.8	5.1	3.1	2.0	1.7	0
MD 97 (Georgia Ave)	I-495 Exit 31	14.1	13.2	11.2	10.3	9.0	7.7	N/A	N/A	7.2	6.6	14.3	13.1	12.2	10.6	9.9	8.3	6.3	5.2	4.9	3.2
US 29 (Colesville Rd)	I-495 Exit 30	17.2	16.3	14.3	13.4	12.2	10.8	N/A	N/A	10.3	9.7	17.4	16.2	15.4	13.7	13.1	11.4	9.4	8.3	8.0	6.3
MD 193 (University Blvd E)	I-495 Exit 29	19.2	18.3	16.3	15.4	14.1	12.8	N/A	N/A	12.3	11.7	19.4	18.2	17.3	15.7	15.0	13.4	11.4	10.3	10.0	8.3
MD 650 (New Hampshire Ave)	I-495 Exit 28	28.8	27.9	25.9	25.1	23.8	22.5	N/A	N/A	22.0	21.3	29.1	27.8	27.0	25.3	24.7	23.0	21.0	19.9	19.6	17.9
I-95	I-495 Exit 27	35.2	34.2	32.3	31.4	30.1	28.8	N/A	N/A	28.3	27.6	35.4	34.2	33.3	31.7	31.0	29.3	27.3	26.3	26.0	24.2
US 1 (Baltimore Ave)	I-495 Exit 25	41.0	40.1	38.2	37.3	36.0	34.7	N/A	N/A	34.2	33.5	41.3	40.0	39.2	37.5	36.9	35.2	33.2	32.2	31.9	30.1
Greenbelt Metro Station	I-495 Exit 24	42.2	41.3	39.3	38.4	37.1	35.8	N/A	N/A	35.3	34.7	42.4	41.2	40.3	38.7	38.0	36.4	34.4	33.3	33.0	31.3
MD 201 (Kenilworth Ave)	I-495 Exit 23	44.6	43.7	41.8	40.9	39.6	38.3	N/A	N/A	37.8	37.1	44.9	43.6	42.8	41.2	40.5	38.8	36.8	35.8	35.5	33.7
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	46.2	45.3	43.3	42.4	41.1	39.8	N/A	N/A	39.3	38.7	46.4	45.2	44.3	42.7	42.0	40.4	38.4	37.3	37.0	35.3
MD 450 (Annapolis Rd)	I-495 Exit 20	49.1	48.2	46.2	45.3	44.1	42.7	N/A	N/A	42.2	41.6	49.3	48.1	47.3	45.6	45.0	43.3	41.3	40.2	39.9	38.2
US 50 (John Hanson Hwy)	I-495 Exit 19	50.7	49.8	47.8	46.9	45.7	44.3	N/A	N/A	43.8	43.2	50.9	49.7	48.9	47.2	46.6	44.9	42.9	41.8	41.5	39.8
MD 202 (Landover Rd)	I-495 Exit 17	55.7	54.8	52.9	52.0	50.7	49.4	N/A	N/A	48.9	48.2	56.0	54.7	53.9	52.2	51.6	49.9	47.9	46.8	46.5	44.8
Arena Dr	I-495 Exit 16	57.2	56.3	54.3	53.4	52.1	50.8	N/A	N/A	50.3	49.7	57.4	56.2	55.3	53.7	53.0	51.4	49.4	48.3	48.0	46.3
MD 214 (Central Ave)	I-495 Exit 15	62.2	61.3	59.4	58.5	57.2	55.9	N/A	N/A	55.4	54.7	62.5	61.2	60.4	58.8	58.1	56.4	54.4	53.4	53.1	51.3
Ritchie-Marlboro Rd	I-495 Exit 13	70.1	69.2	67.2	66.4	65.1	63.7	N/A	N/A	63.2	62.6	70.4	69.1	68.3	66.6	66.0	64.3	62.3	61.2	60.9	59.2
MD 4 (Pennsylvania Ave)	I-495 Exit 11	82.6	81.7	79.7	78.9	77.6	76.3	N/A	N/A	75.8	75.1	82.9	81.6	80.8	79.1	78.5	76.8	74.8	73.7	73.4	71.7
MD 337 (Suitland Pkwy)	I-495 Exit 9	84.3	83.4	81.4	80.6	79.3	78.0	N/A	N/A	77.5	76.8	84.6	83.3	82.5	80.8	80.2	78.5	76.5	75.4	75.1	73.4
MD 5 (Branch Ave)	I-495 Exit 7	86.6	85.7	83.7	82.9	81.6	80.3	N/A	N/A	79.8	79.1	86.9	85.6	84.8	83.1	82.5	80.8	78.8	77.7	77.4	75.7
MD 414 (St Barnabas Rd)	I-495 Exit 4	91.0	90.1	88.1	87.3	86.0	84.6	N/A	N/A	84.1	83.5	91.3	90.0	89.2	87.5	86.9	85.2	83.2	82.1	81.8	80.1

Unit: Minute

From	T	I-495 Exit 31	I-495 Exit 30	I-495 Exit 29	I-495 Exit 28	I-495 Exit 27	I-495 Exit 25	I-495 Exit 24	I-495 Exit 23	I-495 Exit 22	I-495 Exit 20	I-495 Exit 19	I-495 Exit 17	I-495 Exit 16	I-495 Exit 15	I-495 Exit 13	I-495 Exit 11	I-495 Exit 9	I-495 Exit 7	I-495 Exit 4
I-370	I-270 Exit 9	17.3	18.8	19.5	21.3	22.9	24.1	25.2	26.7	27.6	30.0	31.4	33.3	34.0	35.1	36.8	39.2	41.4	55.4	84.3
Shady Grove Rd	I-270 Exit 8	16.2	17.7	18.4	20.3	21.9	23.0	24.1	25.6	26.6	28.9	30.3	32.3	33.0	34.1	35.8	38.1	40.4	54.4	83.2
MD 28 (W Montgomery Ave)	I-270 Exit 6	13.9	15.4	16.1	18.0	19.6	20.8	21.8	23.3	24.3	26.6	28.0	30.0	30.7	31.8	33.5	35.9	38.1	52.1	80.9
MD 189 (Falls Rd)	I-270 Exit 5	12.8	14.3	15.0	16.8	18.4	19.6	20.7	22.2	23.1	25.5	26.9	28.9	29.5	30.7	32.3	34.7	37.0	50.9	79.8
Montrose Rd	I-270 Exit 4	11.1	12.6	13.3	15.1	16.7	17.9	19.0	20.5	21.5	23.8	25.2	27.2	27.8	29.0	30.7	33.0	35.3	49.2	78.1
Split	I-270	8.2	9.6	10.4	12.2	13.8	15.0	16.0	17.6	18.5	20.8	22.2	24.2	24.9	26.0	27.7	30.1	32.3	46.3	75.2
Westlake Terrace	I-270 W Spur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	7.7	9.2	9.9	11.8	13.4	14.6	15.6	17.1	18.1	20.4	21.8	23.8	24.5	25.6	27.3	29.7	31.9	45.9	74.7
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	7.0	8.5	9.2	11.0	12.6	13.8	14.9	16.4	17.3	19.7	21.1	23.1	23.7	24.9	26.5	28.9	31.2	45.1	74.0
VA 193 (Georgetown Pike)	I-495 Exit 44	15.2	16.7	17.4	19.2	20.8	22.0	23.1	24.6	25.6	27.9	29.3	31.3	31.9	33.1	34.7	37.1	39.4	53.3	82.2
George Washington Memorial Pkwy	I-495 Exit 43	13.9	15.4	16.1	17.9	19.5	20.7	21.8	23.3	24.2	26.6	28.0	30.0	30.6	31.8	33.4	35.8	38.1	52.0	80.9
Clara Barton Pkwy	I-495 Exit 41	13.0	14.5	15.2	17.0	18.6	19.8	20.9	22.4	23.4	25.7	27.1	29.1	29.7	30.9	32.6	34.9	37.2	51.1	80.0
Cabin John Pkwy	I-495 Exit 40	11.1	12.6	13.3	15.2	16.8	18.0	19.0	20.5	21.5	23.8	25.2	27.2	27.9	29.0	30.7	33.1	35.3	49.3	78.1
MD 190 (River Rd)	I-495 Exit 39	10.8	12.3	13.0	14.8	16.4	17.6	18.7	20.2	21.2	23.5	24.9	26.9	27.5	28.7	30.3	32.7	35.0	48.9	77.8
I-270 West Spur	I-495 Exit 38	9.3	10.8	11.5	13.3	14.9	16.1	17.2	18.7	19.7	22.0	23.4	25.4	26.0	27.2	28.8	31.2	33.5	47.4	76.3
MD 187 (Old Georgetown Rd)	I-495 Exit 36	6.9	8.4	9.1	11.0	12.5	13.7	14.8	16.3	17.3	19.6	21.0	23.0	23.7	24.8	26.5	28.8	31.1	45.1	73.9
I-270 East Spur	I-495 Exit 35	5.5	6.9	7.7	9.5	11.1	12.3	13.3	14.9	15.8	18.1	19.5	21.5	22.2	23.3	25.0	27.4	29.6	43.6	72.4
MD 355 (Rockville Pike)	I-495 Exit 34	4.7	6.2	6.9	8.7	10.3	11.5	12.6	14.1	15.1	17.4	18.8	20.8	21.4	22.6	24.3	26.6	28.9	42.9	71.7
MD 185 (Connecticut Ave)	I-495 Exit 33	2.2	3.7	4.4	6.3	7.9	9.1	10.1	11.6	12.6	14.9	16.3	18.3	19.0	20.1	21.8	24.2	26.4	40.4	69.2
MD 97 (Georgia Ave)	I-495 Exit 31	0	1.5	2.2	4.0	5.6	6.8	7.9	9.4	10.4	12.7	14.1	16.1	16.7	17.9	19.6	21.9	24.2	38.1	67.0
US 29 (Colesville Rd)	I-495 Exit 30	4.2	0	0.7	2.6	4.1	5.3	6.4	7.9	8.9	11.2	12.6	14.6	15.3	16.4	18.1	20.4	22.7	36.7	65.5
MD 193 (University Blvd E)	I-495 Exit 29	6.1	3.0	0	1.8	3.4	4.6	5.7	7.2	8.2	10.5	11.9	13.9	14.5	15.7	17.4	19.7	22.0	35.9	64.8
MD 650 (New Hampshire Ave)	I-495 Exit 28	15.8	12.6	8.2	0	1.6	2.8	3.8	5.4	6.3	8.6	10.0	12.0	12.7	13.8	15.5	17.9	20.1	34.1	63.0
I-95	I-495 Exit 27	22.1	19.0	14.5	11.1	0	1.2	2.3	3.8	4.7	7.1	8.5	10.4	11.1	12.2	13.9	16.3	18.5	32.5	61.4
US 1 (Baltimore Ave)	I-495 Exit 25	28.0	24.9	20.4	17.0	5.9	0	1.1	2.6	3.5	5.9	7.3	9.3	9.9	11.1	12.7	15.1	17.4	31.3	60.2
Greenbelt Metro Station	I-495 Exit 24	29.1	26.0	21.6	18.1	7.0	1.1	0	1.5	2.5	4.8	6.2	8.2	8.9	10.0	11.7	14.0	16.3	30.3	59.1
MD 201 (Kenilworth Ave)	I-495 Exit 23	31.6	28.5	24.0	20.6	9.5	3.6	2.5	0	1.0	3.3	4.7	6.7	7.3	8.5	10.2	12.5	14.8	28.8	57.6
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	33.1	30.0	25.6	22.1	11.0	5.1	4.0	1.5	0	2.3	3.7	5.7	6.4	7.5	9.2	11.6	13.8	27.8	56.6
MD 450 (Annapolis Rd)	I-495 Exit 20	36.1	32.9	28.5	25.1	13.9	8.1	6.9	4.5	2.9	0	1.4	3.4	4.1	5.2	6.9	9.2	11.5	25.5	54.3
US 50 (John Hanson Hwy)	I-495 Exit 19	37.7	34.5	30.1	26.7	15.5	9.7	8.5	6.0	4.5	1.6	0	2.0	2.7	3.8	5.5	7.8	10.1	24.1	52.9
MD 202 (Landover Rd)	I-495 Exit 17	42.7	39.6	35.1	31.7	20.6	14.7	13.6	11.1	9.6	6.6	5.0	0	0.7	1.8	3.5	5.8	8.1	22.1	50.9
Arena Dr	I-495 Exit 16	44.1	41.0	36.6	33.1	22.0	16.1	15.0	12.5	11.0	8.1	6.5	1.4	0	1.1	2.8	5.2	7.4	21.4	50.3
MD 214 (Central Ave)	I-495 Exit 15	49.2	46.1	41.6	38.2	27.1	21.2	20.1	17.6	16.1	13.1	11.6	6.5	5.1	0	1.7	4.0	6.3	20.3	49.1
Ritchie-Marlboro Rd	I-495 Exit 13	57.1	53.9	49.5	46.1	35.0	29.1	27.9	25.5	23.9	21.0	19.4	14.4	12.9	7.9	0	2.4	4.6	18.6	47.4
MD 4 (Pennsylvania Ave)	I-495 Exit 11	69.6	66.4	62.0	58.6	47.5	41.6	40.4	38.0	36.4	33.5	31.9	26.9	25.4	20.4	12.5	0	2.3	16.2	45.1
MD 337 (Suitland Pkwy)	I-495 Exit 9	71.3	68.2	63.7	60.3	49.2	43.3	42.1	39.7	38.1	35.2	33.6	28.6	27.1	22.1	14.2	1.7	0	14.0	42.8
MD 5 (Branch Ave)	I-495 Exit 7	73.6	70.5	66.0	62.6	51.5	45.6	44.4	42.0	40.4	37.5	35.9	30.9	29.4	24.4	16.5	4.0	2.3	0	28.8
MD 414 (St Barnabas Rd)	I-495 Exit 4	78.0	74.8	70.4	67.0	55.8	50.0	48.8	46.4	44.8	41.9	40.3	35.3	33.8	28.8	20.9	8.4	6.7	4.4	0

Travel Time Matrix - Alternative 9 Phase 1 - ETL (AM Peak)

Unit: Minute

From	T	I-270 Exit 9	I-270 Exit 8	I-270 Exit 6	I-270 Exit 5	I-270 Exit 4	I-270 Split	Westlake Terr	I-270 Exit 1	I-270 Exit 1B	I-270 Exit 1A	I-495 Exit 44	I-495 Exit 43	I-495 Exit 41	I-495 Exit 40	I-495 Exit 39	I-495 Exit 38	I-495 Exit 36	I-495 Exit 35	I-495 Exit 34	I-495 Exit 33
I-370	I-270 Exit 9	0	0.9	2.9	3.8	4.9	6.2	7.0	7.4	6.6	7.3	13.0	12.0	11.3	9.9	9.4	8.3	N/A	8.9	9.6	12.1
Shady Grove Rd	I-270 Exit 8	0.8	0	1.9	2.9	4.0	5.2	6.0	6.5	5.7	6.4	12.1	11.1	10.4	9.0	8.4	7.3	N/A	7.9	8.7	11.2
MD 28 (W Montgomery Ave)	I-270 Exit 6	2.7	1.9	0	1.0	2.0	3.3	4.1	4.6	3.7	4.5	10.2	9.1	8.4	7.1	6.5	5.4	N/A	6.0	6.8	9.2
MD 189 (Falls Rd)	I-270 Exit 5	3.5	2.7	0.8	0	1.1	2.3	3.2	3.6	2.8	3.5	9.2	8.2	7.5	6.1	5.6	4.4	N/A	5.0	5.8	8.3
Montrose Rd	I-270 Exit 4	4.8	3.9	2.1	1.2	0	1.3	2.1	2.5	1.7	2.5	8.1	7.1	6.4	5.0	4.5	3.4	N/A	4.0	4.7	7.2
Split	I-270	5.9	5.0	3.2	2.3	1.1	0	0.8	1.3	0.4	1.2	6.9	5.8	5.1	3.8	3.2	2.1	N/A	2.7	3.5	5.9
Westlake Terrace	I-270 W Spur	6.8	6.0	4.1	3.3	2.1	1.0	0	0.4	N/A	N/A	6.1	5.0	4.3	3.0	2.4	1.3	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	7.2	6.4	4.5	3.7	2.5	1.4	0.4	0	N/A	N/A	5.6	4.6	3.9	2.5	2.0	0.9	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	6.4	5.5	3.7	2.8	1.6	0.5	N/A	N/A	0	0.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.3	3.0	5.5
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	7.0	6.2	4.3	3.5	2.3	1.2	N/A	N/A	0.7	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.5	2.3	4.7
VA 193 (Georgetown Pike)	I-495 Exit 44	13.3	12.4	10.6	9.8	8.5	7.4	6.4	6.0	N/A	N/A	0	1.1	1.9	3.5	3.8	5.1	7.5	9.0	9.7	12.2
George Washington Memorial Pkwy	I-495 Exit 43	12.2	11.3	9.5	8.6	7.4	6.3	5.3	4.9	N/A	N/A	1.0	0	0.8	2.4	2.7	4.0	6.4	7.9	8.6	11.1
Clara Barton Pkwy	I-495 Exit 41	11.4	10.6	8.7	7.9	6.7	5.6	4.6	4.2	N/A	N/A	1.7	0.7	0	1.6	1.9	3.3	5.6	7.1	7.8	10.3
Cabin John Pkwy	I-495 Exit 40	9.8	8.9	7.1	6.3	5.0	3.9	2.9	2.6	N/A	N/A	3.1	2.1	1.4	0	0.3	1.6	4.0	5.5	6.2	8.7
MD 190 (River Rd)	I-495 Exit 39	9.5	8.6	6.8	6.0	4.7	3.6	2.6	2.3	N/A	N/A	3.7	2.6	1.9	0.6	0	1.3	3.7	5.2	5.9	8.4
I-270 West Spur	I-495 Exit 38	8.1	7.3	5.4	4.6	3.4	2.3	1.3	0.9	N/A	N/A	4.8	3.7	3.0	1.7	1.1	0	2.4	3.8	4.6	7.0
MD 187 (Old Georgetown Rd)	I-495 Exit 36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.8	5.8	5.1	3.7	3.2	2.1	0	1.5	2.2	4.7
I-270 East Spur	I-495 Exit 35	8.4	7.5	5.7	4.9	3.6	2.5	N/A	N/A	2.0	1.4	7.9	6.8	6.1	4.8	4.2	3.1	1.1	0	0.7	3.2
MD 355 (Rockville Pike)	I-495 Exit 34	8.7	7.8	6.0	5.2	3.9	2.8	N/A	N/A	2.3	1.7	8.2	7.1	6.4	5.1	4.5	3.4	1.4	0.3	0	2.5
MD 185 (Connecticut Ave)	I-495 Exit 33	10.4	9.6	7.7	6.9	5.7	4.6	N/A	N/A	4.1	3.4	9.9	8.9	8.2	6.8	6.3	5.1	3.1	2.0	1.7	0
MD 97 (Georgia Ave)	I-495 Exit 31	13.6	12.7	10.9	10.1	8.8	7.7	N/A	N/A	7.2	6.6	13.1	12.0	11.3	10.0	9.4	8.3	6.3	5.2	4.9	3.2
US 29 (Colesville Rd)	I-495 Exit 30	16.7	15.9	14.0	13.2	11.9	10.8	N/A	N/A	10.3	9.7	16.2	15.2	14.5	13.1	12.5	11.4	9.4	8.3	8.0	6.3
MD 193 (University Blvd E)	I-495 Exit 29	18.7	17.8	16.0	15.2	13.9	12.8	N/A	N/A	12.3	11.7	18.2	17.1	16.4	15.1	14.5	13.4	11.4	10.3	10.0	8.3
MD 650 (New Hampshire Ave)	I-495 Exit 28	28.3	27.5	25.6	24.8	23.6	22.5	N/A	N/A	22.0	21.3	27.8	26.8	26.1	24.7	24.2	23.0	21.0	19.9	19.6	17.9
I-95	I-495 Exit 27	34.7	33.8	32.0	31.1	29.9	28.8	N/A	N/A	28.3	27.6	34.2	33.1	32.4	31.1	30.5	29.4	27.3	26.3	26.0	24.2
US 1 (Baltimore Ave)	I-495 Exit 25	40.5	39.7	37.8	37.0	35.8	34.7	N/A	N/A	34.2	33.5	40.0	39.0	38.3	36.9	36.4	35.3	33.2	32.2	31.9	30.1
Greenbelt Metro Station	I-495 Exit 24	41.7	40.8	39.0	38.2	36.9	35.8	N/A	N/A	35.3	34.7	41.2	40.1	39.4	38.1	37.5	36.4	34.4	33.3	33.0	31.3
MD 201 (Kenilworth Ave)	I-495 Exit 23	44.1	43.3	41.4	40.6	39.4	38.3	N/A	N/A	37.8	37.1	43.6	42.6	41.9	40.5	40.0	38.9	36.8	35.8	35.5	33.7
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	45.7	44.8	43.0	42.2	40.9	39.8	N/A	N/A	39.3	38.7	45.2	44.1	43.4	42.1	41.5	40.4	38.4	37.3	37.0	35.3
MD 450 (Annapolis Rd)	I-495 Exit 20	48.6	47.8	45.9	45.1	43.8	42.7	N/A	N/A	42.2	41.6	48.1	47.1	46.4	45.0	44.4	43.3	41.3	40.2	39.9	38.2
US 50 (John Hanson Hwy)	I-495 Exit 19	50.2	49.3	47.5	46.7	45.4	44.3	N/A	N/A	43.8	43.2	49.7	48.7	47.9	46.6	46.0	44.9	42.9	41.8	41.5	39.8
MD 202 (Landover Rd)	I-495 Exit 17	55.2	54.4	52.5	51.7	50.5	49.4	N/A	N/A	48.9	48.2	54.7	53.7	53.0	51.6	51.1	50.0	47.9	46.8	46.5	44.8
Arena Dr	I-495 Exit 16	56.7	55.8	54.0	53.2	51.9	50.8	N/A	N/A	50.3	49.7	56.2	55.1	54.4	53.1	52.5	51.4	49.4	48.3	48.0	46.3
MD 214 (Central Ave)	I-495 Exit 15	61.7	60.9	59.0	58.2	57.0	55.9	N/A	N/A	55.4	54.7	61.2	60.2	59.5	58.1	57.6	56.5	54.4	53.4	53.1	51.3
Ritchie-Marlboro Rd	I-495 Exit 13	69.6	68.8	66.9	66.1	64.8	63.7	N/A	N/A	63.2	62.6	69.1	68.1	67.4	66.0	65.4	64.3	62.3	61.2	60.9	59.2
MD 4 (Pennsylvania Ave)	I-495 Exit 11	82.1	81.3	79.4	78.6	77.4	76.3	N/A	N/A	75.8	75.1	81.6	80.6	79.9	78.5	78.0	76.8	74.8	73.7	73.4	71.7
MD 337 (Suitland Pkwy)	I-495 Exit 9	83.8	83.0	81.1	80.3	79.1	78.0	N/A	N/A	77.5	76.8	83.3	82.3	81.6	80.2	79.7	78.6	76.5	75.4	75.1	73.4
MD 5 (Branch Ave)	I-495 Exit 7	86.1	85.3	83.4	82.6	81.4	80.3	N/A	N/A	79.8	79.1	85.6	84.6	83.9	82.5	82.0	80.9	78.8	77.7	77.4	75.7
MD 414 (St Barnabas Rd)	I-495 Exit 4	90.5	89.7	87.8	87.0	85.7	84.6	N/A	N/A	84.1	83.5	90.0	89.0	88.3	86.9	86.3	85.2	83.2	82.1	81.8	80.1

Unit: Minute

From	T	I-495 Exit 31	I-495 Exit 30	I-495 Exit 29	I-495 Exit 28	I-495 Exit 27	I-495 Exit 25	I-495 Exit 24	I-495 Exit 23	I-495 Exit 22	I-495 Exit 20	I-495 Exit 19	I-495 Exit 17	I-495 Exit 16	I-495 Exit 15	I-495 Exit 13	I-495 Exit 11	I-495 Exit 9	I-495 Exit 7	I-495 Exit 4
I-370	I-270 Exit 9	14.3	15.8	16.5	18.4	20.0	21.1	22.2	23.7	24.7	27.0	28.4	30.4	31.1	32.2	33.9	36.2	38.5	52.5	81.3
Shady Grove Rd	I-270 Exit 8	13.4	14.9	15.6	17.4	19.0	20.2	21.3	22.8	23.8	26.1	27.5	29.5	30.1	31.3	33.0	35.3	37.6	51.5	80.4
MD 28 (W Montgomery Ave)	I-270 Exit 6	11.5	12.9	13.7	15.5	17.1	18.3	19.3	20.9	21.8	24.1	25.5	27.5	28.2	29.3	31.0	33.4	35.6	49.6	78.5
MD 189 (Falls Rd)	I-270 Exit 5	10.5	12.0	12.7	14.5	16.1	17.3	18.4	19.9	20.9	23.2	24.6	26.6	27.2	28.4	30.1	32.4	34.7	48.6	77.5
Montrose Rd	I-270 Exit 4	9.4	10.9	11.6	13.5	15.1	16.3	17.3	18.8	19.8	22.1	23.5	25.5	26.2	27.3	29.0	31.4	33.6	47.6	76.4
Split	I-270	8.2	9.6	10.4	12.2	13.8	15.0	16.0	17.6	18.5	20.8	22.2	24.2	24.9	26.0	27.7	30.1	32.3	46.3	75.2
Westlake Terrace	I-270 W Spur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	7.7	9.2	9.9	11.8	13.4	14.6	15.6	17.1	18.1	20.4	21.8	23.8	24.5	25.6	27.3	29.7	31.9	45.9	74.7
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	7.0	8.5	9.2	11.0	12.6	13.8	14.9	16.4	17.3	19.7	21.1	23.1	23.7	24.9	26.5	28.9	31.2	45.1	74.0
VA 193 (Georgetown Pike)	I-495 Exit 44	14.4	15.9	16.6	18.5	20.0	21.2	22.3	23.8	24.8	27.1	28.5	30.5	31.2	32.3	34.0	36.3	38.6	52.6	81.4
George Washington Memorial Pkwy	I-495 Exit 43	13.3	14.8	15.5	17.3	18.9	20.1	21.2	22.7	23.7	26.0	27.4	29.4	30.0	31.2	32.9	35.2	37.5	51.5	80.3
Clara Barton Pkwy	I-495 Exit 41	12.6	14.0	14.8	16.6	18.2	19.4	20.4	22.0	22.9	25.2	26.6	28.6	29.3	30.4	32.1	34.5	36.7	50.7	79.5
Cabin John Pkwy	I-495 Exit 40	10.9	12.4	13.1	15.0	16.6	17.7	18.8	20.3	21.3	23.6	25.0	27.0	27.7	28.8	30.5	32.8	35.1	49.1	77.9
MD 190 (River Rd)	I-495 Exit 39	10.6	12.1	12.8	14.7	16.2	17.4	18.5	20.0	21.0	23.3	24.7	26.7	27.4	28.5	30.2	32.5	34.8	48.8	77.6
I-270 West Spur	I-495 Exit 38	9.3	10.8	11.5	13.3	14.9	16.1	17.2	18.7	19.6	22.0	23.4	25.4	26.0	27.2	28.8	31.2	33.5	47.4	76.3
MD 187 (Old Georgetown Rd)	I-495 Exit 36	6.9	8.4	9.1	11.0	12.5	13.7	14.8	16.3	17.3	19.6	21.0	23.0	23.7	24.8	26.5	28.8	31.1	45.1	73.9
I-270 East Spur	I-495 Exit 35	5.5	6.9	7.7	9.5	11.1	12.3	13.3	14.9	15.8	18.1	19.5	21.5	22.2	23.3	25.0	27.4	29.6	43.6	72.4
MD 355 (Rockville Pike)	I-495 Exit 34	4.7	6.2	6.9	8.7	10.3	11.5	12.6	14.1	15.1	17.4	18.8	20.8	21.4	22.6	24.3	26.6	28.9	42.9	71.7
MD 185 (Connecticut Ave)	I-495 Exit 33	2.2	3.7	4.4	6.3	7.9	9.1	10.1	11.6	12.6	14.9	16.3	18.3	19.0	20.1	21.8	24.2	26.4	40.4	69.2
MD 97 (Georgia Ave)	I-495 Exit 31	0	1.5	2.2	4.0	5.6	6.8	7.9	9.4	10.4	12.7	14.1	16.1	16.7	17.9	19.6	21.9	24.2	38.1	67.0
US 29 (Colesville Rd)	I-495 Exit 30	4.2	0	0.7	2.6	4.1	5.3	6.4	7.9	8.9	11.2	12.6	14.6	15.3	16.4	18.1	20.4	22.7	36.7	65.5
MD 193 (University Blvd E)	I-495 Exit 29	6.1	3.0	0	1.8	3.4	4.6	5.7	7.2	8.2	10.5	11.9	13.9	14.5	15.7	17.4	19.7	22.0	35.9	64.8
MD 650 (New Hampshire Ave)	I-495 Exit 28	15.8	12.6	8.2	0	1.6	2.8	3.8	5.4	6.3	8.6	10.0	12.0	12.7	13.8	15.5	17.9	20.1	34.1	63.0
I-95	I-495 Exit 27	22.1	19.0	14.5	11.1	0	1.2	2.3	3.8	4.7	7.1	8.5	10.4	11.1	12.2	13.9	16.3	18.5	32.5	61.4
US 1 (Baltimore Ave)	I-495 Exit 25	28.0	24.9	20.4	17.0	5.9	0	1.1	2.6	3.5	5.9	7.3	9.3	9.9	11.1	12.7	15.1	17.4	31.3	60.2
Greenbelt Metro Station	I-495 Exit 24	29.1	26.0	21.6	18.1	7.0	1.1	0	1.5	2.5	4.8	6.2	8.2	8.9	10.0	11.7	14.0	16.3	30.3	59.1
MD 201 (Kenilworth Ave)	I-495 Exit 23	31.6	28.5	24.0	20.6	9.5	3.6	2.5	0	1.0	3.3	4.7	6.7	7.3	8.5	10.2	12.5	14.8	28.8	57.6
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	33.1	30.0	25.6	22.1	11.0	5.1	4.0	1.5	0	2.3	3.7	5.7	6.4	7.5	9.2	11.6	13.8	27.8	56.6
MD 450 (Annapolis Rd)	I-495 Exit 20	36.1	32.9	28.5	25.1	13.9	8.1	6.9	4.5	2.9	0	1.4	3.4	4.1	5.2	6.9	9.2	11.5	25.5	54.3
US 50 (John Hanson Hwy)	I-495 Exit 19	37.7	34.5	30.1	26.7	15.5	9.7	8.5	6.0	4.5	1.6	0	2.0	2.7	3.8	5.5	7.8	10.1	24.1	52.9
MD 202 (Landover Rd)	I-495 Exit 17	42.7	39.6	35.1	31.7	20.6	14.7	13.6	11.1	9.6	6.6	5.0	0	0.7	1.8	3.5	5.8	8.1	22.1	50.9
Arena Dr	I-495 Exit 16	44.1	41.0	36.6	33.1	22.0	16.1	15.0	12.5	11.0	8.1	6.5	1.4	0	1.1	2.8	5.2	7.4	21.4	50.3
MD 214 (Central Ave)	I-495 Exit 15	49.2	46.1	41.6	38.2	27.1	21.2	20.1	17.6	16.1	13.1	11.6	6.5	5.1	0	1.7	4.0	6.3	20.3	49.1
Ritchie-Marlboro Rd	I-495 Exit 13	57.1	53.9	49.5	46.1	35.0	29.1	27.9	25.5	23.9	21.0	19.4	14.4	12.9	7.9	0	2.4	4.6	18.6	47.4
MD 4 (Pennsylvania Ave)	I-495 Exit 11	69.6	66.4	62.0	58.6	47.5	41.6	40.4	38.0	36.4	33.5	31.9	26.9	25.4	20.4	12.5	0	2.3	16.2	45.1
MD 337 (Suitland Pkwy)	I-495 Exit 9	71.3	68.2	63.7	60.3	49.2	43.3	42.1	39.7	38.1	35.2	33.6	28.6	27.1	22.1	14.2	1.7	0	14.0	42.8
MD 5 (Branch Ave)	I-495 Exit 7	73.6	70.5	66.0	62.6	51.5	45.6	44.4	42.0	40.4	37.5	35.9	30.9	29.4	24.4	16.5	4.0	2.3	0	28.8
MD 414 (St Barnabas Rd)	I-495 Exit 4	78.0	74.8	70.4	67.0	55.8	50.0	48.8	46.4	44.8	41.9	40.3	35.3	33.8	28.8	20.9	8.4	6.7	4.4	0

Travel Time Matrix - Existing Condition (PM Peak)

Unit: Minute

From	To	I-270 Exit 9	I-270 Exit 8	I-270 Exit 6	I-270 Exit 5	I-270 Exit 4	I-270 Split	Westlake Terr	I-270 Exit 1	I-270 Exit 1B	I-270 Exit 1A	I-495 Exit 44	I-495 Exit 43	I-495 Exit 41	I-495 Exit 40	I-495 Exit 39	I-495 Exit 38	I-495 Exit 36	I-495 Exit 35	I-495 Exit 34	I-495 Exit 33
I-370	I-270 Exit 9	0	0.9	2.9	3.9	5.0	6.4	7.2	7.7	6.9	7.7	25.1	21.2	20.2	16.8	14.7	9.7	N/A	10.3	12.1	19.3
Shady Grove Rd	I-270 Exit 8	2.1	0	2.0	3.0	4.1	5.6	6.3	6.8	6.0	6.8	24.2	20.3	19.3	15.9	13.9	8.8	N/A	9.4	11.2	18.4
MD 28 (W Montgomery Ave)	I-270 Exit 6	4.3	2.3	0	1.0	2.1	3.5	4.3	4.8	4.0	4.8	22.2	18.3	17.3	13.9	11.8	6.8	N/A	7.4	9.1	16.3
MD 189 (Falls Rd)	I-270 Exit 5	5.3	3.3	1.0	0	1.1	2.5	3.3	3.8	3.0	3.8	21.2	17.3	16.3	12.9	10.8	5.8	N/A	6.4	8.2	15.4
Montrose Rd	I-270 Exit 4	6.9	4.8	2.6	1.6	0	1.4	2.2	2.7	1.9	2.7	20.1	16.2	15.2	11.8	9.7	4.7	N/A	5.3	7.1	14.3
Split	I-270	8.6	6.5	4.3	3.3	1.7	0	0.8	1.3	0.5	1.3	18.6	14.8	13.7	10.4	8.3	3.2	N/A	3.8	5.6	12.8
Westlake Terrace	I-270 W Spur	10.3	8.3	6.0	5.0	3.4	1.7	0	0.5	N/A	N/A	17.9	14.0	13.0	9.6	7.5	2.5	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	11.7	9.6	7.3	6.3	4.8	3.0	1.3	0	N/A	N/A	17.4	13.5	12.5	9.1	7.0	2.0	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	9.8	7.8	5.5	4.5	2.9	1.2	N/A	N/A	0	0.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.4	5.2	12.4
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	10.6	8.5	6.2	5.2	3.7	2.0	N/A	N/A	0.8	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.6	4.4	11.6
VA 193 (Georgetown Pike)	I-495 Exit 44	34.5	32.4	30.1	29.1	27.5	25.8	24.1	22.8	N/A	N/A	0	7.4	10.0	17.1	18.3	21.3	24.0	26.6	28.4	35.5
George Washington Memorial Pkwy	I-495 Exit 43	27.1	25.0	22.8	21.7	20.2	18.5	16.7	15.4	N/A	N/A	3.9	0	2.7	9.7	11.0	14.0	16.7	19.2	21.0	28.2
Clara Barton Pkwy	I-495 Exit 41	24.4	22.4	20.1	19.1	17.5	15.8	14.1	12.8	N/A	N/A	4.9	1.0	0	7.1	8.3	11.3	14.0	16.6	18.3	25.5
Cabin John Pkwy	I-495 Exit 40	17.4	15.3	13.0	12.0	10.5	8.8	7.0	5.7	N/A	N/A	8.3	4.4	3.4	0	1.3	4.3	7.0	9.5	11.3	18.5
MD 190 (River Rd)	I-495 Exit 39	16.1	14.0	11.8	10.8	9.2	7.5	5.8	4.4	N/A	N/A	10.3	6.5	5.5	2.1	0	3.0	5.7	8.2	10.0	17.2
I-270 West Spur	I-495 Exit 38	13.1	11.0	8.8	7.8	6.2	4.5	2.8	1.4	N/A	N/A	15.4	11.5	10.5	7.1	5.1	0	2.7	5.2	7.0	14.2
MD 187 (Old Georgetown Rd)	I-495 Exit 36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18.4	14.6	13.5	10.1	8.1	3.0	0	2.5	4.3	11.5
I-270 East Spur	I-495 Exit 35	12.0	10.0	7.7	6.7	5.1	3.4	N/A	N/A	2.2	1.5	19.5	15.6	14.6	11.2	9.1	4.1	1.1	0	1.8	9.0
MD 355 (Rockville Pike)	I-495 Exit 34	12.3	10.3	8.0	7.0	5.4	3.7	N/A	N/A	2.5	1.8	19.8	15.9	14.9	11.5	9.4	4.4	1.4	0.3	0	7.2
MD 185 (Connecticut Ave)	I-495 Exit 33	14.1	12.0	9.8	8.8	7.2	5.5	N/A	N/A	4.3	3.5	21.5	17.7	16.6	13.2	11.2	6.1	3.1	2.0	1.7	0
MD 97 (Georgia Ave)	I-495 Exit 31	16.8	14.7	12.4	11.4	9.8	8.1	N/A	N/A	6.9	6.2	24.2	20.3	19.3	15.9	13.8	8.8	5.8	4.7	4.4	2.7
US 29 (Colesville Rd)	I-495 Exit 30	17.9	15.9	13.6	12.6	11.0	9.3	N/A	N/A	8.1	7.3	25.4	21.5	20.5	17.1	15.0	10.0	7.0	5.9	5.6	3.8
MD 193 (University Blvd E)	I-495 Exit 29	19.4	17.3	15.1	14.1	12.5	10.8	N/A	N/A	9.6	8.8	26.8	23.0	21.9	18.5	16.5	11.4	8.4	7.4	7.0	5.3
MD 650 (New Hampshire Ave)	I-495 Exit 28	21.8	19.7	17.5	16.5	14.9	13.2	N/A	N/A	12.0	11.2	29.3	25.4	24.4	21.0	18.9	13.9	10.8	9.8	9.5	7.7
I-95	I-495 Exit 27	22.8	20.8	18.5	17.5	15.9	14.2	N/A	N/A	13.0	12.3	30.3	26.4	25.4	22.0	19.9	14.9	11.9	10.8	10.5	8.8
US 1 (Baltimore Ave)	I-495 Exit 25	23.9	21.8	19.6	18.5	17.0	15.3	N/A	N/A	14.1	13.3	31.3	27.5	26.4	23.0	21.0	15.9	12.9	11.8	11.5	9.8
Greenbelt Metro Station	I-495 Exit 24	25.1	23.1	20.8	19.8	18.2	16.5	N/A	N/A	15.3	14.6	32.6	28.7	27.7	24.3	22.2	17.2	14.2	13.1	12.8	11.1
MD 201 (Kenilworth Ave)	I-495 Exit 23	28.0	26.0	23.7	22.7	21.1	19.4	N/A	N/A	18.2	17.5	35.5	31.6	30.6	27.2	25.1	20.1	17.1	16.0	15.7	13.9
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	31.6	29.5	27.3	26.3	24.7	23.0	N/A	N/A	21.8	21.0	39.0	35.2	34.2	30.8	28.7	23.6	20.6	19.6	19.3	17.5
MD 450 (Annapolis Rd)	I-495 Exit 20	37.2	35.1	32.9	31.9	30.3	28.6	N/A	N/A	27.4	26.6	44.6	40.8	39.8	36.4	34.3	29.2	26.2	25.2	24.9	23.1
US 50 (John Hanson Hwy)	I-495 Exit 19	38.8	36.7	34.5	33.5	31.9	30.2	N/A	N/A	29.0	28.2	46.2	42.4	41.3	38.0	35.9	30.8	27.8	26.8	26.5	24.7
MD 202 (Landover Rd)	I-495 Exit 17	44.8	42.7	40.4	39.4	37.9	36.1	N/A	N/A	34.9	34.2	52.2	48.3	47.3	43.9	41.9	36.8	33.8	32.7	32.4	30.7
Arena Dr	I-495 Exit 16	47.7	45.6	43.4	42.3	40.8	39.1	N/A	N/A	37.9	37.1	55.1	51.3	50.2	46.8	44.8	39.7	36.7	35.6	35.3	33.6
MD 214 (Central Ave)	I-495 Exit 15	52.3	50.2	48.0	47.0	45.4	43.7	N/A	N/A	42.5	41.7	59.7	55.9	54.9	51.5	49.4	44.3	41.3	40.3	40.0	38.2
Ritchie-Marlboro Rd	I-495 Exit 13	55.8	53.8	51.5	50.5	48.9	47.2	N/A	N/A	46.0	45.3	63.3	59.4	58.4	55.0	52.9	47.9	44.9	43.8	43.5	41.8
MD 4 (Pennsylvania Ave)	I-495 Exit 11	58.7	56.6	54.3	53.3	51.7	50.0	N/A	N/A	48.8	48.1	66.1	62.2	61.2	57.8	55.7	50.7	47.7	46.6	46.3	44.6
MD 337 (Suitland Pkwy)	I-495 Exit 9	61.7	59.6	57.4	56.4	54.8	53.1	N/A	N/A	51.9	51.1	69.1	65.3	64.3	60.9	58.8	53.7	50.7	49.7	49.4	47.6
MD 5 (Branch Ave)	I-495 Exit 7	65.8	63.7	61.5	60.5	58.9	57.2	N/A	N/A	56.0	55.2	73.2	69.4	68.4	65.0	62.9	57.8	54.8	53.8	53.5	51.7
MD 414 (St Barnabas Rd)	I-495 Exit 4	68.9	66.8	64.5	63.5	62.0	60.2	N/A	N/A	59.0	58.3	76.3	72.4	71.4	68.0	66.0	60.9	57.9	56.8	56.5	54.8

Unit: Minute

From	To	I-495 Exit 31	I-495 Exit 30	I-495 Exit 29	I-495 Exit 28	I-495 Exit 27	I-495 Exit 25	I-495 Exit 24	I-495 Exit 23	I-495 Exit 22	I-495 Exit 20	I-495 Exit 19	I-495 Exit 17	I-495 Exit 16	I-495 Exit 15	I-495 Exit 13	I-495 Exit 11	I-495 Exit 9	I-495 Exit 7	I-495 Exit 4
I-370	I-270 Exit 9	26.0	29.2	31.9	35.0	36.9	40.6	42.0	43.7	44.9	49.1	54.3	59.6	61.3	62.7	64.7	67.5	68.8	70.8	73.2
Shady Grove Rd	I-270 Exit 8	25.1	28.3	31.0	34.2	36.1	39.7	41.1	42.8	44.0	48.2	53.4	58.7	60.5	61.9	63.9	66.6	67.9	69.9	72.3
MD 28 (W Montgomery Ave)	I-270 Exit 6	23.0	26.2	29.0	32.1	34.0	37.7	39.0	40.8	42.0	46.2	51.4	56.7	58.4	59.8	61.8	64.6	65.8	67.9	70.3
MD 189 (Falls Rd)	I-270 Exit 5	22.1	25.2	28.0	31.1	33.0	36.7	38.1	39.8	41.0	45.2	50.4	55.7	57.4	58.8	60.8	63.6	64.8	66.9	69.3
Montrose Rd	I-270 Exit 4	21.0	24.2	26.9	30.0	31.9	35.6	37.0	38.7	39.9	44.1	49.3	54.6	56.3	57.7	59.7	62.5	63.8	65.8	68.2
Split	I-270	19.5	22.7	25.4	28.6	30.5	34.1	35.5	37.3	38.5	42.6	47.9	53.2	54.9	56.3	58.3	61.1	62.3	64.4	66.8
Westlake Terrace	I-270 W Spur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	19.1	22.3	25.0	28.1	30.0	33.7	35.1	36.8	38.0	42.2	47.4	52.7	54.4	55.8	57.8	60.6	61.9	63.9	66.3
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	18.3	21.5	24.2	27.3	29.2	32.9	34.3	36.0	37.2	41.4	46.6	51.9	53.6	55.0	57.0	59.8	61.1	63.1	65.5
VA 193 (Georgetown Pike)	I-495 Exit 44	42.3	45.4	48.2	51.3	53.2	56.9	58.2	60.0	61.2	65.4	70.6	75.9	77.6	79.0	81.0	83.8	85.0	87.1	89.5
George Washington Memorial Pkwy	I-495 Exit 43	34.9	38.1	40.8	44.0	45.9	49.5	50.9	52.6	53.8	58.0	63.2	68.5	70.3	71.7	73.7	76.4	77.7	79.7	82.1
Clara Barton Pkwy	I-495 Exit 41	32.2	35.4	38.1	41.3	43.2	46.9	48.2	50.0	51.2	55.4	60.6	65.9	67.6	69.0	71.0	73.8	75.0	77.1	79.5
Cabin John Pkwy	I-495 Exit 40	25.2	28.4	31.1	34.3	36.2	39.8	41.2	42.9	44.1	48.3	53.5	58.8	60.6	62.0	64.0	66.7	68.0	70.0	72.4
MD 190 (River Rd)	I-495 Exit 39	23.9	27.1	29.8	33.0	34.9	38.5	39.9	41.7	42.9	47.0	52.3	57.6	59.3	60.7	62.7	65.5	66.7	68.8	71.1
I-270 West Spur	I-495 Exit 38	20.9	24.1	26.8	30.0	31.9	35.5	36.9	38.6	39.9	44.0	49.3	54.6	56.3	57.7	59.7	62.5	63.7	65.8	68.1
MD 187 (Old Georgetown Rd)	I-495 Exit 36	18.2	21.4	24.1	27.3	29.2	32.8	34.2	36.0	37.2	41.3	46.6	51.9	53.6	55.0	57.0	59.8	61.0	63.1	65.4
I-270 East Spur	I-495 Exit 35	15.7	18.9	21.6	24.8	26.7	30.3	31.7	33.4	34.6	38.8	44.0	49.3	51.1	52.5	54.5	57.2	58.5	60.5	62.9
MD 355 (Rockville Pike)	I-495 Exit 34	13.9	17.1	19.8	23.0	24.9	28.5	29.9	31.6	32.8	37.0	42.2	47.6	49.3	50.7	52.7	55.4	56.7	58.7	61.1
MD 185 (Connecticut Ave)	I-495 Exit 33	6.7	9.9	12.6	15.8	17.7	21.3	22.7	24.4	25.7	29.8	35.0	40.4	42.1	43.5	45.5	48.3	49.5	51.5	53.9
MD 97 (Georgia Ave)	I-495 Exit 31	0	3.2	5.9	9.1	11.0	14.6	16.0	17.7	18.9	23.1	28.3	33.7	35.4	36.8	38.8	41.5	42.8	44.8	47.2
US 29 (Colesville Rd)	I-495 Exit 30	1.7	0	2.7	5.9	7.8	11.4	12.8	14.5	15.8	19.9	25.1	30.5	32.2	33.6	35.6	38.4	39.6	41.7	44.0
MD 193 (University Blvd E)	I-495 Exit 29	3.2	0.8	0	3.2	5.1	8.7	10.1	11.8	13.0	17.2	22.4	27.8	29.5	30.9	32.9	35.6	36.9	38.9	41.3
MD 650 (New Hampshire Ave)	I-495 Exit 28	5.6	3.3	1.7	0	1.9	5.5	6.9	8.7	9.9	14.0	19.3	24.6	26.3	27.7	29.7	32.5	33.7	35.8	38.2
I-95	I-495 Exit 27	6.6	4.3	2.7	1.8	0	3.6	5.0	6.8	8.0	12.1	17.4	22.7	24.4	25.8	27.8	30.6	31.8	33.9	36.3
US 1 (Baltimore Ave)	I-495 Exit 25	7.6	5.3	3.7	2.9	1.0	0	1.4	3.1	4.3	8.5	13.7	19.0	20.8	22.2	24.2	26.9	28.2	30.2	32.6
Greenbelt Metro Station	I-495 Exit 24	8.9	6.6	5.0	4.1	2.3	1.3	0	1.7	3.0	7.1	12.3	17.7	19.4	20.8	22.8	25.6	26.8	28.8	31.2
MD 201 (Kenilworth Ave)	I-495 Exit 23	11.8	9.5	7.9	7.0	5.2	4.2	2.9	0	1.2	5.4	10.6	15.9	17.6	19.0	21.0	23.8	25.1	27.1	29.5
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	15.4	13.0	11.5	10.6	8.8	7.7	6.5	3.6	0	4.2	9.4	14.7	16.4	17.8	19.8	22.6	23.8	25.9	28.3
MD 450 (Annapolis Rd)	I-495 Exit 20	21.0	18.6	17.1	16.2	14.4	13.3	12.1	9.2	5.6	0	5.2	10.5	12.3	13.7	15.7	18.4	19.7	21.7	24.1
US 50 (John Hanson Hwy)	I-495 Exit 19	22.6	20.2	18.7	17.8	16.0	14.9	13.7	10.8	7.2	1.6	0	5.3	7.0	8.4	10.4	13.2	14.5	16.5	18.9
MD 202 (Landover Rd)	I-495 Exit 17	28.5	26.2	24.6	23.8	21.9	20.9	19.6	16.7	13.2	7.6	6.0	0	1.7	3.1	5.1	7.9	9.1	11.2	13.6
Arena Dr	I-495 Exit 16	31.4	29.1	27.5	26.7	24.8	23.8	22.5	19.6	16.1	10.5	8.9	2.9	0	1.4	3.4	6.2	7.4	9.5	11.9
MD 214 (Central Ave)	I-495 Exit 15	36.1	33.7	32.2	31.3	29.5	28.4	27.2	24.3	20.7	15.1	13.5	7.5	4.6	0	2.0	4.8	6.0	8.1	10.5
Ritchie-Marlboro Rd	I-495 Exit 13	39.6	37.3	35.7	34.8	33.0	32.0	30.7	27.8	24.2	18.6	17.0	11.1	8.2	3.5	0	2.8	4.0	6.1	8.5
MD 4 (Pennsylvania Ave)	I-495 Exit 11	42.4	40.1	38.5	37.6	35.8	34.8	33.5	30.6	27.0	21.4	19.9	13.9	11.0	6.3	2.8	0	1.2	3.3	5.7
MD 337 (Suitland Pkwy)	I-495 Exit 9	45.5	43.1	41.6	40.7	38.9	37.8	36.6	33.7	30.1	24.5	22.9	16.9	14.0	9.4	5.9	3.1	0	2.1	4.4
MD 5 (Branch Ave)	I-495 Exit 7	49.6	47.2	45.7	44.8	43.0	41.9	40.7	37.8	34.2	28.6	27.0	21.0	18.1	13.5	10.0	7.2	4.1	0	2.4
MD 414 (St Barnabas Rd)	I-495 Exit 4	52.6	50.3	48.7	47.9	46.0	45.0	43.7	40.8	37.3	31.7	30.1	24.1	21.2	16.6	13.0	10.2	7.2	3.1	0

Travel Time Matrix - 2045 No Build (PM Peak)

Unit: Minute

From	To	I-270 Exit 9	I-270 Exit 8	I-270 Exit 6	I-270 Exit 5	I-270 Exit 4	I-270 Split	Westlake Terr	I-270 Exit 1	I-270 Exit 1B	I-270 Exit 1A	I-495 Exit 44	I-495 Exit 43	I-495 Exit 41	I-495 Exit 40	I-495 Exit 39	I-495 Exit 38	I-495 Exit 36	I-495 Exit 35	I-495 Exit 34	I-495 Exit 33
I-370	I-270 Exit 9	0	0.9	2.9	3.9	5.0	6.4	7.2	7.7	6.9	7.7	21.6	20.4	19.5	15.3	13.3	8.6	N/A	12.3	14.3	21.4
Shady Grove Rd	I-270 Exit 8	3.1	0	2.0	3.0	4.1	5.6	6.3	6.8	6.0	6.8	20.7	19.5	18.6	14.4	12.4	7.7	N/A	11.4	13.5	20.5
MD 28 (W Montgomery Ave)	I-270 Exit 6	6.3	3.2	0	1.0	2.1	3.5	4.3	4.8	4.0	4.8	18.7	17.5	16.6	12.4	10.4	5.7	N/A	9.4	11.4	18.5
MD 189 (Falls Rd)	I-270 Exit 5	7.5	4.4	1.1	0	1.1	2.5	3.3	3.8	3.0	3.8	17.7	16.5	15.6	11.4	9.4	4.7	N/A	8.4	10.4	17.5
Montrose Rd	I-270 Exit 4	9.0	5.9	2.6	1.5	0	1.4	2.2	2.7	1.9	2.7	16.6	15.4	14.5	10.3	8.3	3.6	N/A	7.3	9.3	16.4
Split	I-270	10.6	7.5	4.2	3.1	1.6	0	0.8	1.3	0.5	1.3	15.2	13.9	13.1	8.9	6.9	2.1	N/A	5.8	7.9	14.9
Westlake Terrace	I-270 W Spur	11.6	8.5	5.2	4.1	2.6	1.0	0	0.5	N/A	N/A	14.4	13.2	12.3	8.1	6.1	1.4	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	12.0	8.9	5.7	4.6	3.1	1.5	0.5	0	N/A	N/A	13.9	12.7	11.8	7.6	5.6	0.9	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	12.1	9.0	5.8	4.6	3.1	1.5	N/A	N/A	0	0.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.4	7.4	14.5
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	13.6	10.5	7.2	6.1	4.6	3.0	N/A	N/A	1.5	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	4.6	6.6	13.7
VA 193 (Georgetown Pike)	I-495 Exit 44	35.5	32.4	29.2	28.0	26.5	24.9	23.9	23.5	N/A	N/A	0	7.6	10.4	17.0	18.5	22.5	36.8	42.9	45.0	52.0
George Washington Memorial Pkwy	I-495 Exit 43	27.9	24.8	21.6	20.4	18.9	17.3	16.3	15.9	N/A	N/A	1.2	0	2.9	9.4	10.9	14.9	29.2	35.3	37.4	44.4
Clara Barton Pkwy	I-495 Exit 41	25.1	21.9	18.7	17.6	16.1	14.5	13.5	13.0	N/A	N/A	2.1	0.9	0	6.6	8.1	12.0	26.4	32.5	34.5	41.6
Cabin John Pkwy	I-495 Exit 40	18.5	15.4	12.2	11.0	9.5	7.9	6.9	6.5	N/A	N/A	6.3	5.1	4.2	0	1.5	5.5	19.8	25.9	28.0	35.0
MD 190 (River Rd)	I-495 Exit 39	17.0	13.9	10.6	9.5	8.0	6.4	5.4	4.9	N/A	N/A	8.3	7.1	6.2	2.0	0	4.0	18.3	24.4	26.4	33.5
I-270 West Spur	I-495 Exit 38	13.0	9.9	6.7	5.5	4.0	2.4	1.4	1.0	N/A	N/A	13.0	11.8	10.9	6.7	4.7	0	14.3	20.4	22.5	29.5
MD 187 (Old Georgetown Rd)	I-495 Exit 36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	25.6	24.3	23.4	19.2	17.3	12.5	0	6.1	8.1	15.2
I-270 East Spur	I-495 Exit 35	15.1	11.9	8.7	7.6	6.1	4.5	N/A	N/A	3.0	1.5	33.9	32.7	31.8	27.6	25.6	20.9	8.4	0	2.1	9.1
MD 355 (Rockville Pike)	I-495 Exit 34	17.0	13.8	10.6	9.5	8.0	6.4	N/A	N/A	4.9	3.4	35.8	34.6	33.7	29.5	27.5	22.8	10.3	1.9	0	7.0
MD 185 (Connecticut Ave)	I-495 Exit 33	21.7	18.6	15.3	14.2	12.7	11.1	N/A	N/A	9.6	8.1	40.5	39.3	38.4	34.2	32.2	27.5	15.0	6.6	4.7	0
MD 97 (Georgia Ave)	I-495 Exit 31	27.3	24.2	21.0	19.8	18.4	16.7	N/A	N/A	15.2	13.8	46.2	44.9	44.1	39.9	37.9	33.1	20.6	12.3	10.4	5.7
US 29 (Colesville Rd)	I-495 Exit 30	30.0	26.8	23.6	22.5	21.0	19.4	N/A	N/A	17.8	16.4	48.8	47.6	46.7	42.5	40.5	35.8	23.2	14.9	13.0	8.3
MD 193 (University Blvd E)	I-495 Exit 29	32.4	29.3	26.0	24.9	23.4	21.8	N/A	N/A	20.3	18.8	51.2	50.0	49.1	44.9	42.9	38.2	25.7	17.3	15.4	10.7
MD 650 (New Hampshire Ave)	I-495 Exit 28	35.0	31.9	28.6	27.5	26.0	24.4	N/A	N/A	22.9	21.4	53.8	52.6	51.7	47.5	45.5	40.8	28.3	19.9	18.0	13.3
I-95	I-495 Exit 27	36.0	32.9	29.7	28.5	27.0	25.4	N/A	N/A	23.9	22.4	54.8	53.6	52.7	48.5	46.5	41.8	29.3	20.9	19.0	14.3
US 1 (Baltimore Ave)	I-495 Exit 25	37.1	34.0	30.7	29.6	28.1	26.5	N/A	N/A	25.0	23.5	55.9	54.7	53.8	49.6	47.6	42.9	30.4	22.0	20.1	15.4
Greenbelt Metro Station	I-495 Exit 24	38.1	35.0	31.7	30.6	29.1	27.5	N/A	N/A	26.0	24.5	56.9	55.7	54.8	50.6	48.6	43.9	31.4	23.0	21.1	16.4
MD 201 (Kenilworth Ave)	I-495 Exit 23	40.6	37.4	34.2	33.1	31.6	30.0	N/A	N/A	28.5	27.0	59.4	58.2	57.3	53.1	51.1	46.4	33.9	25.5	23.6	18.9
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	44.6	41.5	38.3	37.1	35.6	34.0	N/A	N/A	32.5	31.0	63.5	62.2	61.3	57.2	55.2	50.4	37.9	29.6	27.7	22.9
MD 450 (Annapolis Rd)	I-495 Exit 20	56.0	52.8	49.6	48.5	47.0	45.4	N/A	N/A	43.8	42.4	74.8	73.6	72.7	68.5	66.5	61.8	49.2	40.9	39.0	34.3
US 50 (John Hanson Hwy)	I-495 Exit 19	61.8	58.6	55.4	54.3	52.8	51.2	N/A	N/A	49.6	48.2	80.6	79.3	78.5	74.3	72.3	67.5	55.0	46.7	44.8	40.1
MD 202 (Landover Rd)	I-495 Exit 17	67.7	64.5	61.3	60.2	58.7	57.1	N/A	N/A	55.6	54.1	86.5	85.3	84.4	80.2	78.2	73.5	61.0	52.6	50.7	46.0
Arena Dr	I-495 Exit 16	70.7	67.6	64.4	63.2	61.7	60.1	N/A	N/A	58.6	57.1	89.6	88.3	87.4	83.3	81.3	76.5	64.0	55.6	53.7	49.0
MD 214 (Central Ave)	I-495 Exit 15	76.0	72.8	69.6	68.5	67.0	65.4	N/A	N/A	63.9	62.4	94.8	93.6	92.7	88.5	86.5	81.8	69.2	60.9	59.0	54.3
Ritchie-Marlboro Rd	I-495 Exit 13	82.4	79.3	76.1	75.0	73.5	71.9	N/A	N/A	70.3	68.9	101.3	100.0	99.2	95.0	93.0	88.2	75.7	67.4	65.5	60.8
MD 4 (Pennsylvania Ave)	I-495 Exit 11	89.3	86.2	83.0	81.9	80.4	78.8	N/A	N/A	77.2	75.8	108.2	106.9	106.1	101.9	99.9	95.1	82.6	74.3	72.4	67.7
MD 337 (Suitland Pkwy)	I-495 Exit 9	93.3	90.1	86.9	85.8	84.3	82.7	N/A	N/A	81.1	79.7	112.1	110.9	110.0	105.8	103.8	99.1	86.5	78.2	76.3	71.6
MD 5 (Branch Ave)	I-495 Exit 7	99.4	96.3	93.1	91.9	90.4	88.8	N/A	N/A	87.3	85.8	118.2	117.0	116.1	111.9	109.9	105.2	92.7	84.3	82.4	77.7
MD 414 (St Barnabas Rd)	I-495 Exit 4	102.7	99.6	96.4	95.3	93.8	92.2	N/A	N/A	90.6	89.2	121.6	120.3	119.5	115.3	113.3	108.5	96.0	87.7	85.8	81.1

Unit: Minute

From	To	I-495 Exit 31	I-495 Exit 30	I-495 Exit 29	I-495 Exit 28	I-495 Exit 27	I-495 Exit 25	I-495 Exit 24	I-495 Exit 23	I-495 Exit 22	I-495 Exit 20	I-495 Exit 19	I-495 Exit 17	I-495 Exit 16	I-495 Exit 15	I-495 Exit 13	I-495 Exit 11	I-495 Exit 9	I-495 Exit 7	I-495 Exit 4
I-370	I-270 Exit 9	28.3	32.1	34.6	37.7	44.0	49.3	50.7	52.5	53.8	56.4	58.1	60.9	61.6	63.0	64.9	67.6	68.8	70.9	73.3
Shady Grove Rd	I-270 Exit 8	27.4	31.2	33.7	36.8	43.1	48.4	49.8	51.6	52.9	55.5	57.2	60.0	60.7	62.1	64.0	66.7	67.9	70.0	72.4
MD 28 (W Montgomery Ave)	I-270 Exit 6	25.4	29.2	31.7	34.8	41.1	46.4	47.8	49.6	50.9	53.5	55.2	58.0	58.7	60.1	62.0	64.7	65.9	68.0	70.4
MD 189 (Falls Rd)	I-270 Exit 5	24.4	28.2	30.7	33.8	40.1	45.4	46.8	48.6	49.9	52.5	54.2	57.0	57.7	59.1	61.0	63.7	64.9	67.0	69.4
Montrose Rd	I-270 Exit 4	23.3	27.1	29.6	32.7	39.0	44.3	45.7	47.5	48.8	51.4	53.1	55.9	56.6	58.0	59.9	62.6	63.8	65.9	68.3
Split	I-270	21.9	25.6	28.1	31.3	37.6	42.8	44.2	46.0	47.4	49.9	51.6	54.4	55.2	56.5	58.5	61.1	62.4	64.5	66.9
Westlake Terrace	I-270 W Spur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	21.4	25.2	27.7	30.8	37.1	42.3	43.8	45.6	46.9	49.5	51.2	54.0	54.7	56.1	58.0	60.7	61.9	64.0	66.4
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	20.6	24.4	26.8	30.0	36.3	41.5	42.9	44.8	46.1	48.7	50.4	53.1	53.9	55.3	57.2	59.9	61.1	63.2	65.6
VA 193 (Georgetown Pike)	I-495 Exit 44	58.9	62.7	65.2	68.4	74.6	79.9	81.3	83.1	84.4	87.0	88.7	91.5	92.2	93.6	95.5	98.2	99.4	101.5	103.9
George Washington Memorial Pkwy	I-495 Exit 43	51.3	55.1	57.6	60.8	67.0	72.3	73.7	75.5	76.9	79.4	81.1	83.9	84.6	86.0	87.9	90.6	91.9	93.9	96.3
Clara Barton Pkwy	I-495 Exit 41	48.5	52.3	54.7	57.9	64.2	69.4	70.8	72.7	74.0	76.6	78.3	81.0	81.8	83.1	85.1	87.8	89.0	91.1	93.5
Cabin John Pkwy	I-495 Exit 40	41.9	45.7	48.2	51.3	57.6	62.9	64.3	66.1	67.4	70.0	71.7	74.5	75.2	76.6	78.5	81.2	82.4	84.5	86.9
MD 190 (River Rd)	I-495 Exit 39	40.4	44.2	46.7	49.8	56.1	61.4	62.8	64.6	65.9	68.5	70.2	73.0	73.7	75.1	77.0	79.7	80.9	83.0	85.4
I-270 West Spur	I-495 Exit 38	36.4	40.2	42.7	45.9	52.1	57.4	58.8	60.6	62.0	64.5	66.2	69.0	69.7	71.1	73.0	75.7	77.0	79.0	81.4
MD 187 (Old Georgetown Rd)	I-495 Exit 36	22.1	25.9	28.4	31.5	37.8	43.1	44.5	46.3	47.6	50.2	51.9	54.7	55.4	56.8	58.7	61.4	62.6	64.7	67.1
I-270 East Spur	I-495 Exit 35	16.0	19.8	22.3	25.5	31.7	37.0	38.4	40.2	41.5	44.1	45.8	48.6	49.3	50.7	52.6	55.3	56.5	58.6	61.0
MD 355 (Rockville Pike)	I-495 Exit 34	14.0	17.7	20.2	23.4	29.7	34.9	36.3	38.1	39.5	42.0	43.7	46.5	47.3	48.6	50.6	53.3	54.5	56.6	59.0
MD 185 (Connecticut Ave)	I-495 Exit 33	6.9	10.7	13.2	16.4	22.6	27.9	29.3	31.1	32.4	35.0	36.7	39.5	40.2	41.6	43.5	46.2	47.4	49.5	51.9
MD 97 (Georgia Ave)	I-495 Exit 31	0	3.8	6.3	9.4	15.7	21.0	22.4	24.2	25.5	28.1	29.8	32.6	33.3	34.7	36.6	39.3	40.5	42.6	45.0
US 29 (Colesville Rd)	I-495 Exit 30	2.1	0	2.5	5.6	11.9	17.2	18.6	20.4	21.7	24.3	26.0	28.8	29.5	30.9	32.8	35.5	36.7	38.8	41.2
MD 193 (University Blvd E)	I-495 Exit 29	4.5	0.8	0	3.2	9.4	14.7	16.1	17.9	19.3	21.8	23.5	26.3	27.0	28.4	30.3	33.0	34.3	36.3	38.7
MD 650 (New Hampshire Ave)	I-495 Exit 28	7.1	3.4	1.7	0	6.3	11.5	12.9	14.8	16.1	18.7	20.4	23.1	23.9	25.2	27.2	29.9	31.1	33.2	35.6
I-95	I-495 Exit 27	8.1	4.4	2.7	1.8	0	5.3	6.7	8.5	9.8	12.4	14.1	16.9	17.6	19.0	20.9	23.6	24.8	26.9	29.3
US 1 (Baltimore Ave)	I-495 Exit 25	9.2	5.5	3.8	2.9	1.1	0	1.4	3.2	4.6	7.1	8.8	11.6	12.3	13.7	15.6	18.3	19.6	21.6	24.0
Greenbelt Metro Station	I-495 Exit 24	10.2	6.5	4.8	3.9	2.1	1.0	0	1.8	3.2	5.7	7.4	10.2	10.9	12.3	14.2	16.9	18.2	20.2	22.6
MD 201 (Kenilworth Ave)	I-495 Exit 23	12.7	9.0	7.3	6.4	4.6	3.5	2.5	0	1.3	3.9	5.6	8.4	9.1	10.5	12.4	15.1	16.3	18.4	20.8
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	16.8	13.1	11.3	10.5	8.6	7.5	6.5	4.1	0	2.6	4.3	7.0	7.8	9.1	11.1	13.8	15.0	17.1	19.5
MD 450 (Annapolis Rd)	I-495 Exit 20	28.1	24.4	22.7	21.8	20.0	18.9	17.9	15.4	11.3	0	1.7	4.5	5.2	6.6	8.5	11.2	12.4	14.5	16.9
US 50 (John Hanson Hwy)	I-495 Exit 19	33.9	30.2	28.5	27.6	25.8	24.7	23.7	21.2	17.1	5.8	0	2.8	3.5	4.9	6.8	9.5	10.7	12.8	15.2
MD 202 (Landover Rd)	I-495 Exit 17	39.8	36.1	34.4	33.5	31.7	30.6	29.6	27.1	23.0	11.7	5.9	0	0.7	2.1	4.0	6.7	8.0	10.0	12.4
Arena Dr	I-495 Exit 16	42.8	39.2	37.4	36.6	34.7	33.6	32.6	30.1	26.1	14.8	9.0	3.0	0	1.4	3.3	6.0	7.2	9.3	11.7
MD 214 (Central Ave)	I-495 Exit 15	48.1	44.4	42.7	41.8	40.0	38.9	37.9	35.4	31.3	20.0	14.2	8.3	5.2	0	1.9	4.6	5.9	7.9	10.3
Ritchie-Marlboro Rd	I-495 Exit 13	54.6	50.9	49.2	48.3	46.4	45.4	44.4	41.9	37.8	26.5	20.7	14.8	11.7	6.5	0	2.7	3.9	6.0	8.4
MD 4 (Pennsylvania Ave)	I-495 Exit 11	61.5	57.8	56.1	55.2	53.3	52.3	51.3	48.8	44.7	33.4	27.6	21.7	18.6	13.4	6.9	0	1.2	3.3	5.7
MD 337 (Suitland Pkwy)	I-495 Exit 9	65.4	61.7	60.0	59.1	57.3	56.2	55.2	52.7	48.6	37.3	31.5	25.6	22.5	17.3	10.8	3.9	0	2.1	4.5
MD 5 (Branch Ave)	I-495 Exit 7	71.5	67.8	66.1	65.3	63.4	62.3	61.3	58.8	54.8	43.4	37.6	31.7	28.7	23.4	17.0	10.1	6.1	0	2.4
MD 414 (St Barnabas Rd)	I-495 Exit 4	74.9	71.2	69.5	68.6	66.7	65.6	64.7	62.2	58.1	46.8	41.0	35.1	32.0	26.8	20.3	13.4	9.5	3.3	0

Travel Time Matrix - Alternative 9 Phase 1 - GP Lane (PM Peak)

Unit: Minute

From	T	I-270 Exit 9	I-270 Exit 8	I-270 Exit 6	I-270 Exit 5	I-270 Exit 4	I-270 Split	Westlake Terr	I-270 Exit 1	I-270 Exit 1B	I-270 Exit 1A	I-495 Exit 44	I-495 Exit 43	I-495 Exit 41	I-495 Exit 40	I-495 Exit 39	I-495 Exit 38	I-495 Exit 36	I-495 Exit 35	I-495 Exit 34	I-495 Exit 33
I-370	I-270 Exit 9	0	0.9	3.0	4.0	5.2	6.8	7.5	8.0	7.2	8.0	14.6	13.3	12.5	10.9	10.3	8.8	N/A	9.6	11.3	17.2
Shady Grove Rd	I-270 Exit 8	3.8	0	2.1	3.1	4.4	5.9	6.6	7.1	6.3	7.1	13.7	12.5	11.6	10.0	9.4	7.9	N/A	8.8	10.5	16.3
MD 28 (W Montgomery Ave)	I-270 Exit 6	7.8	4.0	0	1.1	2.3	3.8	4.5	5.0	4.2	5.1	11.6	10.4	9.6	7.9	7.3	5.8	N/A	6.7	8.4	14.2
MD 189 (Falls Rd)	I-270 Exit 5	8.8	5.0	1.0	0	1.2	2.8	3.5	4.0	3.2	4.0	10.6	9.3	8.5	6.8	6.2	4.8	N/A	5.6	7.3	13.2
Montrose Rd	I-270 Exit 4	10.4	6.5	2.6	1.5	0	1.5	2.3	2.8	2.0	2.8	9.4	8.1	7.3	5.6	5.0	3.6	N/A	4.4	6.1	12.0
Split	I-270	12.0	8.1	4.1	3.1	1.6	0	0.7	1.2	0.4	1.2	7.8	6.6	5.7	4.1	3.5	2.0	N/A	2.9	4.6	10.4
Westlake Terrace	I-270 W Spur	12.9	9.0	5.0	4.0	2.5	0.9	0	0.5	N/A	N/A	7.1	5.8	5.0	3.4	2.7	1.3	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	13.3	9.5	5.5	4.5	3.0	1.4	0.5	0	N/A	N/A	6.6	5.4	4.5	2.9	2.3	0.8	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	12.5	8.7	4.7	3.7	2.2	0.6	N/A	N/A	0	0.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.4	4.1	10.0
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	13.3	9.4	5.5	4.4	2.9	1.3	N/A	N/A	0.7	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.6	3.3	9.2
VA 193 (Georgetown Pike)	I-495 Exit 44	38.1	34.3	30.3	29.2	27.7	26.1	25.2	24.8	N/A	N/A	0	1.3	2.3	8.6	11.5	23.6	40.4	45.4	47.1	53.0
George Washington Memorial Pkwy	I-495 Exit 43	36.8	33.0	29.0	28.0	26.5	24.9	24.0	23.5	N/A	N/A	1.3	0	1.1	7.4	10.2	22.4	39.2	44.2	45.9	51.7
Clara Barton Pkwy	I-495 Exit 41	35.8	31.9	27.9	26.9	25.4	23.8	22.9	22.4	N/A	N/A	2.1	0.8	0	6.3	9.1	21.3	38.1	43.1	44.8	50.6
Cabin John Pkwy	I-495 Exit 40	29.5	25.6	21.6	20.6	19.1	17.5	16.6	16.1	N/A	N/A	3.7	2.5	1.7	0	2.8	15.0	31.8	36.8	38.5	44.3
MD 190 (River Rd)	I-495 Exit 39	26.6	22.8	18.8	17.8	16.3	14.7	13.8	13.3	N/A	N/A	4.4	3.1	2.3	0.6	0	12.2	29.0	33.9	35.6	41.5
I-270 West Spur	I-495 Exit 38	14.5	10.6	6.7	5.6	4.1	2.5	1.6	1.1	N/A	N/A	5.8	4.6	3.7	2.1	1.5	0	16.8	21.8	23.5	29.3
MD 187 (Old Georgetown Rd)	I-495 Exit 36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.8	6.5	5.7	4.1	3.4	2.0	0	5.0	6.7	12.5
I-270 East Spur	I-495 Exit 35	14.8	10.9	6.9	5.9	4.4	2.8	N/A	N/A	2.2	1.5	8.9	7.6	6.8	5.1	4.5	3.1	1.1	0	1.7	7.6
MD 355 (Rockville Pike)	I-495 Exit 34	15.1	11.2	7.2	6.2	4.7	3.1	N/A	N/A	2.5	1.8	9.2	7.9	7.1	5.4	4.8	3.4	1.4	0.3	0	5.9
MD 185 (Connecticut Ave)	I-495 Exit 33	17.2	13.4	9.4	8.4	6.9	5.3	N/A	N/A	4.7	3.9	11.3	10.1	9.3	7.6	7.0	5.5	3.5	2.5	2.2	0
MD 97 (Georgia Ave)	I-495 Exit 31	20.1	16.3	12.3	11.3	9.8	8.2	N/A	N/A	7.6	6.9	14.2	13.0	12.2	10.5	9.9	8.4	6.4	5.4	5.1	2.9
US 29 (Colesville Rd)	I-495 Exit 30	21.7	17.9	13.9	12.9	11.4	9.8	N/A	N/A	9.2	8.5	15.8	14.6	13.8	12.1	11.5	10.0	8.0	7.0	6.7	4.5
MD 193 (University Blvd E)	I-495 Exit 29	23.2	19.4	15.4	14.4	12.8	11.2	N/A	N/A	10.7	9.9	17.3	16.1	15.2	13.6	13.0	11.5	9.5	8.4	8.1	6.0
MD 650 (New Hampshire Ave)	I-495 Exit 28	25.6	21.8	17.8	16.8	15.3	13.7	N/A	N/A	13.1	12.4	19.8	18.5	17.7	16.0	15.4	13.9	12.0	10.9	10.6	8.4
I-95	I-495 Exit 27	26.7	22.8	18.8	17.8	16.3	14.7	N/A	N/A	14.1	13.4	20.8	19.5	18.7	17.0	16.4	15.0	13.0	11.9	11.6	9.4
US 1 (Baltimore Ave)	I-495 Exit 25	27.8	24.0	20.0	18.9	17.4	15.8	N/A	N/A	15.2	14.5	21.9	20.6	19.8	18.2	17.5	16.1	14.1	13.0	12.7	10.6
Greenbelt Metro Station	I-495 Exit 24	28.9	25.1	21.1	20.1	18.5	16.9	N/A	N/A	16.4	15.6	23.0	21.8	20.9	19.3	18.7	17.2	15.2	14.1	13.8	11.7
MD 201 (Kenilworth Ave)	I-495 Exit 23	31.4	27.6	23.6	22.6	21.1	19.5	N/A	N/A	18.9	18.2	25.6	24.3	23.5	21.8	21.2	19.7	17.7	16.7	16.4	14.2
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	35.1	31.3	27.3	26.2	24.7	23.1	N/A	N/A	22.5	21.8	29.2	27.9	27.1	25.5	24.8	23.4	21.4	20.3	20.0	17.9
MD 450 (Annapolis Rd)	I-495 Exit 20	43.2	39.4	35.4	34.4	32.9	31.3	N/A	N/A	30.7	30.0	37.3	36.1	35.3	33.6	33.0	31.5	29.5	28.5	28.2	26.0
US 50 (John Hanson Hwy)	I-495 Exit 19	44.8	41.0	37.0	36.0	34.5	32.9	N/A	N/A	32.3	31.6	39.0	37.7	36.9	35.2	34.6	33.2	31.2	30.1	29.8	27.6
MD 202 (Landover Rd)	I-495 Exit 17	50.2	46.4	42.4	41.4	39.8	38.2	N/A	N/A	37.7	36.9	44.3	43.1	42.2	40.6	40.0	38.5	36.5	35.5	35.1	33.0
Arena Dr	I-495 Exit 16	52.7	48.8	44.9	43.8	42.3	40.7	N/A	N/A	40.1	39.4	46.8	45.5	44.7	43.1	42.4	41.0	39.0	37.9	37.6	35.4
MD 214 (Central Ave)	I-495 Exit 15	57.0	53.2	49.2	48.1	46.6	45.0	N/A	N/A	44.4	43.7	51.1	49.8	49.0	47.4	46.7	45.3	43.3	42.2	41.9	39.8
Ritchie-Marlboro Rd	I-495 Exit 13	59.9	56.0	52.1	51.0	49.5	47.9	N/A	N/A	47.3	46.6	54.0	52.7	51.9	50.3	49.6	48.2	46.2	45.1	44.8	42.6
MD 4 (Pennsylvania Ave)	I-495 Exit 11	62.7	58.9	54.9	53.8	52.3	50.7	N/A	N/A	50.2	49.4	56.8	55.5	54.7	53.1	52.4	51.0	49.0	47.9	47.6	45.5
MD 337 (Suitland Pkwy)	I-495 Exit 9	65.8	62.0	58.0	57.0	55.5	53.9	N/A	N/A	53.3	52.5	59.9	58.7	57.8	56.2	55.6	54.1	52.1	51.1	50.8	48.6
MD 5 (Branch Ave)	I-495 Exit 7	70.3	66.5	62.5	61.5	60.0	58.4	N/A	N/A	57.8	57.1	64.4	63.2	62.4	60.7	60.1	58.6	56.6	55.6	55.3	53.1
MD 414 (St Barnabas Rd)	I-495 Exit 4	73.4	69.6	65.6	64.5	63.0	61.4	N/A	N/A	60.8	60.1	67.5	66.2	65.4	63.8	63.1	61.7	59.7	58.6	58.3	56.2

Unit: Minute

From	T	I-495 Exit 31	I-495 Exit 30	I-495 Exit 29	I-495 Exit 28	I-495 Exit 27	I-495 Exit 25	I-495 Exit 24	I-495 Exit 23	I-495 Exit 22	I-495 Exit 20	I-495 Exit 19	I-495 Exit 17	I-495 Exit 16	I-495 Exit 15	I-495 Exit 13	I-495 Exit 11	I-495 Exit 9	I-495 Exit 7	I-495 Exit 4
I-370	I-270 Exit 9	23.3	26.4	28.7	31.5	36.3	40.9	42.2	44.4	45.8	48.3	50.6	54.1	55.5	57.7	59.6	62.3	63.5	65.6	68.0
Shady Grove Rd	I-270 Exit 8	22.4	25.6	27.8	30.6	35.5	40.0	41.3	43.6	44.9	47.5	49.7	53.2	54.7	56.8	58.8	61.4	62.7	64.7	67.1
MD 28 (W Montgomery Ave)	I-270 Exit 6	20.3	23.5	25.7	28.5	33.4	37.9	39.2	41.5	42.8	45.4	47.6	51.1	52.6	54.7	56.7	59.3	60.6	62.6	65.0
MD 189 (Falls Rd)	I-270 Exit 5	19.3	22.4	24.6	27.4	32.3	36.9	38.2	40.4	41.7	44.3	46.6	50.1	51.5	53.7	55.6	58.3	59.5	61.6	64.0
Montrose Rd	I-270 Exit 4	18.0	21.2	23.4	26.2	31.1	35.6	37.0	39.2	40.5	43.1	45.4	48.9	50.3	52.5	54.4	57.1	58.3	60.4	62.8
Split	I-270	16.5	19.7	21.9	24.7	29.6	34.1	35.4	37.7	39.0	41.6	43.8	47.3	48.8	50.9	52.9	55.5	56.8	58.8	61.2
Westlake Terrace	I-270 W Spur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	16.1	19.2	21.4	24.2	29.1	33.7	35.0	37.2	38.6	41.1	43.4	46.9	48.3	50.5	52.4	55.1	56.3	58.4	60.8
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	15.3	18.4	20.6	23.4	28.3	32.8	34.2	36.4	37.7	40.3	42.6	46.1	47.5	49.7	51.6	54.3	55.5	57.6	60.0
VA 193 (Georgetown Pike)	I-495 Exit 44	59.1	62.2	64.4	67.2	72.1	76.6	78.0	80.2	81.5	84.1	86.4	89.9	91.3	93.5	95.4	98.1	99.3	101.4	103.8
George Washington Memorial Pkwy	I-495 Exit 43	57.8	61.0	63.2	66.0	70.9	75.4	76.7	79.0	80.3	82.9	85.1	88.6	90.1	92.2	94.2	96.8	98.1	100.1	102.5
Clara Barton Pkwy	I-495 Exit 41	56.7	59.9	62.1	64.9	69.8	74.3	75.7	77.9	79.2	81.8	84.0	87.6	89.0	91.1	93.1	95.8	97.0	99.0	101.4
Cabin John Pkwy	I-495 Exit 40	50.4	53.6	55.8	58.6	63.5	68.0	69.4	71.6	72.9	75.5	77.7	81.2	82.7	84.8	86.8	89.5	90.7	92.7	95.1
MD 190 (River Rd)	I-495 Exit 39	47.6	50.7	53.0	55.8	60.7	65.2	66.5	68.7	70.1	72.6	74.9	78.4	79.8	82.0	84.0	86.6	87.9	89.9	92.3
I-270 West Spur	I-495 Exit 38	35.4	38.6	40.8	43.6	48.5	53.0	54.4	56.6	57.9	60.5	62.7	66.3	67.7	69.9	71.8	74.5	75.7	77.8	80.1
MD 187 (Old Georgetown Rd)	I-495 Exit 36	18.6	21.8	24.0	26.8	31.7	36.2	37.6	39.8	41.1	43.7	45.9	49.4	50.9	53.0	55.0	57.7	58.9	60.9	63.3
I-270 East Spur	I-495 Exit 35	13.6	16.8	19.0	21.8	26.7	31.2	32.6	34.8	36.1	38.7	41.0	44.5	45.9	48.1	50.0	52.7	53.9	56.0	58.4
MD 355 (Rockville Pike)	I-495 Exit 34	11.9	15.1	17.3	20.1	25.0	29.5	30.9	33.1	34.4	37.0	39.3	42.8	44.2	46.4	48.3	51.0	52.2	54.3	56.7
MD 185 (Connecticut Ave)	I-495 Exit 33	6.1	9.2	11.5	14.3	19.2	23.7	25.0	27.2	28.6	31.1	33.4	36.9	38.3	40.5	42.4	45.1	46.4	48.4	50.8
MD 97 (Georgia Ave)	I-495 Exit 31	0	3.2	5.4	8.2	13.1	17.6	18.9	21.2	22.5	25.1	27.3	30.8	32.3	34.4	36.4	39.0	40.3	42.3	44.7
US 29 (Colesville Rd)	I-495 Exit 30	1.7	0	2.2	5.0	9.9	14.4	15.8	18.0	19.3	21.9	24.2	27.7	29.1	31.3	33.2	35.9	37.1	39.2	41.6
MD 193 (University Blvd E)	I-495 Exit 29	3.2	0.8	0	2.8	7.7	12.2	13.6	15.8	17.1	19.7	21.9	25.4	26.9	29.0	31.0	33.7	34.9	36.9	39.3
MD 650 (New Hampshire Ave)	I-495 Exit 28	5.6	3.3	1.7	0	4.9	9.4	10.8	13.0	14.3	16.9	19.1	22.7	24.1	26.2	28.2	30.9	32.1	34.1	36.5
I-95	I-495 Exit 27	6.6	4.3	2.7	1.8	0	4.5	5.9	8.1	9.4	12.0	14.2	17.8	19.2	21.4	23.3	26.0	27.2	29.3	31.6
US 1 (Baltimore Ave)	I-495 Exit 25	7.8	5.4	3.8	3.0	1.1	0	1.3	3.6	4.9	7.5	9.7	13.2	14.7	16.8	18.8	21.4	22.7	24.7	27.1
Greenbelt Metro Station	I-495 Exit 24	8.9	6.5	4.9	4.1	2.2	1.1	0	2.2	3.6	6.1	8.4	11.9	13.3	15.5	17.4	20.1	21.3	23.4	25.8
MD 201 (Kenilworth Ave)	I-495 Exit 23	11.4	9.1	7.5	6.6	4.8	3.7	2.5	0	1.3	3.9	6.2	9.7	11.1	13.3	15.2	17.9	19.1	21.2	23.6
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	15.1	12.7	11.1	10.3	8.4	7.3	6.2	3.6	0	2.6	4.8	8.3	9.8	11.9	13.9	16.5	17.8	19.8	22.2
MD 450 (Annapolis Rd)	I-495 Exit 20	23.2	20.9	19.3	18.4	16.6	15.5	14.3	11.8	8.2	0	2.3	5.8	7.2	9.4	11.3	14.0	15.2	17.3	19.7
US 50 (John Hanson Hwy)	I-495 Exit 19	24.8	22.5	20.9	20.0	18.2	17.1	16.0	13.4	9.8	1.6	0	3.5	4.9	7.1	9.0	11.7	12.9	15.0	17.4
MD 202 (Landover Rd)	I-495 Exit 17	30.2	27.8	26.3	25.4	23.5	22.4	21.3	18.8	15.1	7.0	5.4	0	1.4	3.6	5.5	8.2	9.4	11.5	13.9
Arena Dr	I-495 Exit 16	32.7	30.3	28.7	27.9	26.0	24.9	23.8	21.2	17.6	9.4	7.8	2.5	0	2.2	4.1	6.8	8.0	10.1	12.5
MD 214 (Central Ave)	I-495 Exit 15	37.0	34.6	33.0	32.2	30.3	29.2	28.1	25.5	21.9	13.7	12.1	6.8	4.3	0	1.9	4.6	5.8	7.9	10.3
Ritchie-Marlboro Rd	I-495 Exit 13	39.9	37.5	35.9	35.1	33.2	32.1	31.0	28.4	24.8	16.6	15.0	9.7	7.2	2.9	0	2.7	3.9	6.0	8.3
MD 4 (Pennsylvania Ave)	I-495 Exit 11	42.7	40.3	38.7	37.9	36.0	34.9	33.8	31.3	27.6	19.5	17.8	12.5	10.0	5.7	2.8	0	1.2	3.3	5.7
MD 337 (Suitland Pkwy)	I-495 Exit 9	45.8	43.5	41.9	41.0	39.2	38.0	36.9	34.4	30.7	22.6	21.0	15.6	13.1	8.8	5.9	3.1	0	2.1	4.4
MD 5 (Branch Ave)	I-495 Exit 7	50.3	48.0	46.4	45.5	43.7	42.5	41.4	38.9	35.2	27.1	25.5	20.1	17.7	13.3	10.5	7.6	4.5	0	2.4
MD 414 (St Barnabas Rd)	I-495 Exit 4	53.4	51.0	49.4	48.6	46.7	45.6	44.5	41.9	38.3	30.1	28.5	23.2	20.7	16.4	13.5	10.7	7.6	3.1	0

Travel Time Matrix - Alternative 9 Phase 1 - ETL (PM Peak)

Unit: Minute

From	T	I-270 Exit 9	I-270 Exit 8	I-270 Exit 6	I-270 Exit 5	I-270 Exit 4	I-270 Split	Westlake Terr	I-270 Exit 1	I-270 Exit 1B	I-270 Exit 1A	I-495 Exit 44	I-495 Exit 43	I-495 Exit 41	I-495 Exit 40	I-495 Exit 39	I-495 Exit 38	I-495 Exit 36	I-495 Exit 35	I-495 Exit 34	I-495 Exit 33
I-370	I-270 Exit 9	0	0.9	2.8	3.7	4.8	6.1	6.9	7.4	6.5	7.4	12.9	11.9	11.2	9.9	9.3	8.2	N/A	9.0	10.7	16.5
Shady Grove Rd	I-270 Exit 8	3.8	0	1.9	2.9	4.0	5.2	6.0	6.5	5.7	6.5	12.1	11.0	10.3	9.0	8.4	7.3	N/A	8.1	9.8	15.6
MD 28 (W Montgomery Ave)	I-270 Exit 6	11.7	7.9	0	0.9	2.0	3.3	4.1	4.6	3.7	4.6	10.1	9.1	8.4	7.1	6.5	5.4	N/A	6.2	7.9	13.7
MD 189 (Falls Rd)	I-270 Exit 5	12.6	8.8	0.9	0	1.1	2.4	3.2	3.6	2.8	3.6	9.2	8.2	7.5	6.1	5.6	4.4	N/A	5.2	6.9	12.8
Montrose Rd	I-270 Exit 4	13.9	10.1	2.2	1.3	0	1.3	2.1	2.5	1.7	2.5	8.1	7.1	6.4	5.0	4.5	3.4	N/A	4.1	5.8	11.7
Split	I-270	15.1	11.3	3.4	2.4	1.2	0	0.8	1.3	0.4	1.2	6.8	5.8	5.1	3.8	3.2	2.1	N/A	2.9	4.6	10.4
Westlake Terrace	I-270 W Spur	16.0	12.2	4.3	3.4	2.1	0.9	0	0.4	N/A	N/A	6.0	5.0	4.3	2.9	2.4	1.3	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	16.4	12.6	4.7	3.8	2.5	1.3	0.4	0	N/A	N/A	5.6	4.5	3.9	2.5	1.9	0.8	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	15.7	11.8	4.0	3.0	1.8	0.6	N/A	N/A	0	0.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.4	4.1	10.0
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	16.4	12.6	4.7	3.8	2.5	1.3	N/A	N/A	0.7	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.6	3.3	9.2
VA 193 (Georgetown Pike)	I-495 Exit 44	22.6	18.7	10.8	9.9	8.7	7.5	6.5	6.2	N/A	N/A	0	1.1	1.9	3.5	3.8	5.3	19.1	24.1	25.8	31.7
George Washington Memorial Pkwy	I-495 Exit 43	21.4	17.6	9.7	8.8	7.5	6.3	5.4	5.0	N/A	N/A	1.0	0	0.7	2.4	2.7	4.1	18.0	23.0	24.7	30.6
Clara Barton Pkwy	I-495 Exit 41	20.7	16.9	9.0	8.0	6.8	5.6	4.7	4.3	N/A	N/A	1.7	0.7	0	1.6	1.9	3.4	17.3	22.2	24.0	29.8
Cabin John Pkwy	I-495 Exit 40	19.1	15.2	7.3	6.4	5.1	4.0	3.0	2.6	N/A	N/A	3.1	2.1	1.4	0	0.3	1.7	15.6	20.6	22.3	28.2
MD 190 (River Rd)	I-495 Exit 39	18.7	14.9	7.0	6.1	4.8	3.6	2.7	2.3	N/A	N/A	3.6	2.6	1.9	0.5	0	1.4	15.3	20.3	22.0	27.9
I-270 West Spur	I-495 Exit 38	17.3	13.5	5.6	4.7	3.4	2.2	1.3	0.9	N/A	N/A	4.8	3.7	3.0	1.7	1.1	0	13.9	18.9	20.6	26.4
MD 187 (Old Georgetown Rd)	I-495 Exit 36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.8	5.7	5.0	3.7	3.1	2.0	0	5.0	6.7	12.5
I-270 East Spur	I-495 Exit 35	17.9	14.0	6.2	5.2	4.0	2.8	N/A	N/A	2.2	1.5	7.8	6.8	6.1	4.7	4.2	3.1	1.1	0	1.7	7.6
MD 355 (Rockville Pike)	I-495 Exit 34	18.2	14.4	6.5	5.5	4.3	3.1	N/A	N/A	2.5	1.8	8.1	7.1	6.4	5.0	4.5	3.4	1.4	0.3	0	5.9
MD 185 (Connecticut Ave)	I-495 Exit 33	20.4	16.5	8.6	7.7	6.5	5.3	N/A	N/A	4.7	3.9	10.3	9.3	8.6	7.2	6.7	5.6	3.5	2.5	2.2	0
MD 97 (Georgia Ave)	I-495 Exit 31	23.3	19.4	11.5	10.6	9.4	8.2	N/A	N/A	7.6	6.9	13.2	12.2	11.5	10.1	9.6	8.5	6.4	5.4	5.1	2.9
US 29 (Colesville Rd)	I-495 Exit 30	24.9	21.0	13.1	12.2	11.0	9.8	N/A	N/A	9.2	8.5	14.8	13.8	13.1	11.7	11.2	10.1	8.0	7.0	6.7	4.5
MD 193 (University Blvd E)	I-495 Exit 29	26.3	22.5	14.6	13.7	12.4	11.2	N/A	N/A	10.7	9.9	16.3	15.2	14.5	13.2	12.6	11.5	9.5	8.4	8.1	6.0
MD 650 (New Hampshire Ave)	I-495 Exit 28	28.8	24.9	17.1	16.1	14.9	13.7	N/A	N/A	13.1	12.4	18.7	17.7	17.0	15.6	15.1	14.0	12.0	10.9	10.6	8.4
I-95	I-495 Exit 27	29.8	26.0	18.1	17.1	15.9	14.7	N/A	N/A	14.1	13.4	19.7	18.7	18.0	16.7	16.1	15.0	13.0	11.9	11.6	9.4
US 1 (Baltimore Ave)	I-495 Exit 25	30.9	27.1	19.2	18.3	17.0	15.8	N/A	N/A	15.2	14.5	20.9	19.8	19.1	17.8	17.2	16.1	14.1	13.0	12.7	10.6
Greenbelt Metro Station	I-495 Exit 24	32.0	28.2	20.3	19.4	18.1	16.9	N/A	N/A	16.4	15.6	22.0	20.9	20.2	18.9	18.3	17.2	15.2	14.1	13.8	11.7
MD 201 (Kenilworth Ave)	I-495 Exit 23	34.6	30.7	22.9	21.9	20.7	19.5	N/A	N/A	18.9	18.2	24.5	23.5	22.8	21.4	20.9	19.8	17.7	16.7	16.4	14.2
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	38.2	34.4	26.5	25.6	24.3	23.1	N/A	N/A	22.5	21.8	28.2	27.1	26.4	25.1	24.5	23.4	21.4	20.3	20.0	17.9
MD 450 (Annapolis Rd)	I-495 Exit 20	46.4	42.5	34.7	33.7	32.5	31.3	N/A	N/A	30.7	30.0	36.3	35.3	34.6	33.2	32.7	31.6	29.5	28.5	28.2	26.0
US 50 (John Hanson Hwy)	I-495 Exit 19	48.0	44.1	36.3	35.3	34.1	32.9	N/A	N/A	32.3	31.6	37.9	36.9	36.2	34.8	34.3	33.2	31.2	30.1	29.8	27.6
MD 202 (Landover Rd)	I-495 Exit 17	53.3	49.5	41.6	40.7	39.4	38.2	N/A	N/A	37.7	36.9	43.3	42.2	41.6	40.2	39.7	38.5	36.5	35.5	35.1	33.0
Arena Dr	I-495 Exit 16	55.8	52.0	44.1	43.2	41.9	40.7	N/A	N/A	40.1	39.4	45.8	44.7	44.0	42.7	42.1	41.0	39.0	37.9	37.6	35.4
MD 214 (Central Ave)	I-495 Exit 15	60.1	56.3	48.4	47.5	46.2	45.0	N/A	N/A	44.4	43.7	50.1	49.0	48.3	47.0	46.4	45.3	43.3	42.2	41.9	39.8
Ritchie-Marlboro Rd	I-495 Exit 13	63.0	59.2	51.3	50.4	49.1	47.9	N/A	N/A	47.3	46.6	53.0	51.9	51.2	49.9	49.3	48.2	46.2	45.1	44.8	42.6
MD 4 (Pennsylvania Ave)	I-495 Exit 11	65.8	62.0	54.1	53.2	51.9	50.7	N/A	N/A	50.2	49.4	55.8	54.7	54.0	52.7	52.1	51.0	49.0	47.9	47.6	45.5
MD 337 (Suitland Pkwy)	I-495 Exit 9	69.0	65.1	57.2	56.3	55.0	53.9	N/A	N/A	53.3	52.5	58.9	57.9	57.2	55.8	55.3	54.1	52.1	51.1	50.8	48.6
MD 5 (Branch Ave)	I-495 Exit 7	73.5	69.6	61.7	60.8	59.6	58.4	N/A	N/A	57.8	57.1	63.4	62.4	61.7	60.3	59.8	58.7	56.6	55.6	55.3	53.1
MD 414 (St Barnabas Rd)	I-495 Exit 4	76.5	72.7	64.8	63.9	62.6	61.4	N/A	N/A	60.8	60.1	66.5	65.4	64.7	63.4	62.8	61.7	59.7	58.6	58.3	56.2

Unit: Minute

From	T	I-495 Exit 31	I-495 Exit 30	I-495 Exit 29	I-495 Exit 28	I-495 Exit 27	I-495 Exit 25	I-495 Exit 24	I-495 Exit 23	I-495 Exit 22	I-495 Exit 20	I-495 Exit 19	I-495 Exit 17	I-495 Exit 16	I-495 Exit 15	I-495 Exit 13	I-495 Exit 11	I-495 Exit 9	I-495 Exit 7	I-495 Exit 4
I-370	I-270 Exit 9	22.6	25.8	28.0	30.8	35.7	40.2	41.5	43.8	45.1	47.7	49.9	53.4	54.9	57.0	59.0	61.6	62.9	64.9	67.3
Shady Grove Rd	I-270 Exit 8	21.7	24.9	27.1	29.9	34.8	39.3	40.7	42.9	44.2	46.8	49.0	52.6	54.0	56.1	58.1	60.8	62.0	64.0	66.4
MD 28 (W Montgomery Ave)	I-270 Exit 6	19.8	23.0	25.2	28.0	32.9	37.4	38.7	41.0	42.3	44.9	47.1	50.6	52.1	54.2	56.2	58.8	60.1	62.1	64.5
MD 189 (Falls Rd)	I-270 Exit 5	18.9	22.0	24.2	27.0	31.9	36.5	37.8	40.0	41.4	43.9	46.2	49.7	51.1	53.3	55.2	57.9	59.1	61.2	63.6
Montrose Rd	I-270 Exit 4	17.8	20.9	23.2	26.0	30.8	35.4	36.7	38.9	40.3	42.8	45.1	48.6	50.0	52.2	54.1	56.8	58.0	60.1	62.5
Split	I-270	16.5	19.7	21.9	24.7	29.6	34.1	35.4	37.7	39.0	41.6	43.8	47.3	48.8	50.9	52.9	55.5	56.8	58.8	61.2
Westlake Terrace	I-270 W Spur	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Democracy Blvd	I-270 Exit 1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rockledge Dr	I-270 Exit 1B	16.1	19.2	21.4	24.2	29.1	33.7	35.0	37.2	38.6	41.1	43.4	46.9	48.3	50.5	52.4	55.1	56.3	58.4	60.8
MD 187 (Old Georgetown Rd)	I-270 Exit 1A	15.3	18.4	20.6	23.4	28.3	32.8	34.2	36.4	37.7	40.3	42.6	46.1	47.5	49.7	51.6	54.3	55.5	57.6	60.0
VA 193 (Georgetown Pike)	I-495 Exit 44	37.8	40.9	43.1	45.9	50.8	55.4	56.7	58.9	60.3	62.8	65.1	68.6	70.0	72.2	74.1	76.8	78.0	80.1	82.5
George Washington Memorial Pkwy	I-495 Exit 43	36.6	39.8	42.0	44.8	49.7	54.2	55.6	57.8	59.1	61.7	64.0	67.5	68.9	71.1	73.0	75.7	76.9	79.0	81.4
Clara Barton Pkwy	I-495 Exit 41	35.9	39.1	41.3	44.1	49.0	53.5	54.8	57.0	58.4	60.9	63.2	66.7	68.2	70.3	72.3	74.9	76.2	78.2	80.6
Cabin John Pkwy	I-495 Exit 40	34.2	37.4	39.6	42.4	47.3	51.8	53.2	55.4	56.7	59.3	61.6	65.1	66.5	68.7	70.6	73.3	74.5	76.6	79.0
MD 190 (River Rd)	I-495 Exit 39	33.9	37.1	39.3	42.1	47.0	51.5	52.9	55.1	56.4	59.0	61.3	64.8	66.2	68.4	70.3	73.0	74.2	76.3	78.7
I-270 West Spur	I-495 Exit 38	32.5	35.7	37.9	40.7	45.6	50.1	51.4	53.7	55.0	57.6	59.8	63.3	64.8	66.9	68.9	71.5	72.8	74.8	77.2
MD 187 (Old Georgetown Rd)	I-495 Exit 36	18.6	21.8	24.0	26.8	31.7	36.2	37.6	39.8	41.1	43.7	45.9	49.4	50.9	53.0	55.0	57.7	58.9	60.9	63.3
I-270 East Spur	I-495 Exit 35	13.6	16.8	19.0	21.8	26.7	31.2	32.6	34.8	36.1	38.7	41.0	44.5	45.9	48.1	50.0	52.7	53.9	56.0	58.4
MD 355 (Rockville Pike)	I-495 Exit 34	11.9	15.1	17.3	20.1	25.0	29.5	30.9	33.1	34.4	37.0	39.3	42.8	44.2	46.4	48.3	51.0	52.2	54.3	56.7
MD 185 (Connecticut Ave)	I-495 Exit 33	6.1	9.2	11.5	14.3	19.2	23.7	25.0	27.2	28.6	31.1	33.4	36.9	38.3	40.5	42.4	45.1	46.4	48.4	50.8
MD 97 (Georgia Ave)	I-495 Exit 31	0	3.2	5.4	8.2	13.1	17.6	18.9	21.2	22.5	25.1	27.3	30.8	32.3	34.4	36.4	39.0	40.3	42.3	44.7
US 29 (Colesville Rd)	I-495 Exit 30	1.7	0	2.2	5.0	9.9	14.4	15.8	18.0	19.3	21.9	24.2	27.7	29.1	31.3	33.2	35.9	37.1	39.2	41.6
MD 193 (University Blvd E)	I-495 Exit 29	3.2	0.8	0	2.8	7.7	12.2	13.6	15.8	17.1	19.7	21.9	25.4	26.9	29.0	31.0	33.7	34.9	36.9	39.3
MD 650 (New Hampshire Ave)	I-495 Exit 28	5.6	3.3	1.7	0	4.9	9.4	10.8	13.0	14.3	16.9	19.1	22.7	24.1	26.2	28.2	30.9	32.1	34.1	36.5
I-95	I-495 Exit 27	6.6	4.3	2.7	1.8	0	4.5	5.9	8.1	9.4	12.0	14.2	17.8	19.2	21.4	23.3	26.0	27.2	29.3	31.6
US 1 (Baltimore Ave)	I-495 Exit 25	7.8	5.4	3.8	3.0	1.1	0	1.3	3.6	4.9	7.5	9.7	13.2	14.7	16.8	18.8	21.4	22.7	24.7	27.1
Greenbelt Metro Station	I-495 Exit 24	8.9	6.5	4.9	4.1	2.2	1.1	0	2.2	3.6	6.1	8.4	11.9	13.3	15.5	17.4	20.1	21.3	23.4	25.8
MD 201 (Kenilworth Ave)	I-495 Exit 23	11.4	9.1	7.5	6.6	4.8	3.7	2.5	0	1.3	3.9	6.2	9.7	11.1	13.3	15.2	17.9	19.1	21.2	23.6
MD 295 (Baltimore-Washington Pkwy)	I-495 Exit 22	15.1	12.7	11.1	10.3	8.4	7.3	6.2	3.6	0	2.6	4.8	8.3	9.8	11.9	13.9	16.5	17.8	19.8	22.2
MD 450 (Annapolis Rd)	I-495 Exit 20	23.2	20.9	19.3	18.4	16.6	15.5	14.3	11.8	8.2	0	2.3	5.8	7.2	9.4	11.3	14.0	15.2	17.3	19.7
US 50 (John Hanson Hwy)	I-495 Exit 19	24.8	22.5	20.9	20.0	18.2	17.1	16.0	13.4	9.8	1.6	0	3.5	4.9	7.1	9.0	11.7	12.9	15.0	17.4
MD 202 (Landover Rd)	I-495 Exit 17	30.2	27.8	26.3	25.4	23.5	22.4	21.3	18.8	15.1	7.0	5.4	0	1.4	3.6	5.5	8.2	9.4	11.5	13.9
Arena Dr	I-495 Exit 16	32.7	30.3	28.7	27.9	26.0	24.9	23.8	21.2	17.6	9.4	7.8	2.5	0	2.2	4.1	6.8	8.0	10.1	12.5
MD 214 (Central Ave)	I-495 Exit 15	37.0	34.6	33.0	32.2	30.3	29.2	28.1	25.5	21.9	13.7	12.1	6.8	4.3	0	1.9	4.6	5.8	7.9	10.3
Ritchie-Marlboro Rd	I-495 Exit 13	39.9	37.5	35.9	35.1	33.2	32.1	31.0	28.4	24.8	16.6	15.0	9.7	7.2	2.9	0	2.7	3.9	6.0	8.3
MD 4 (Pennsylvania Ave)	I-495 Exit 11	42.7	40.3	38.7	37.9	36.0	34.9	33.8	31.3	27.6	19.5	17.8	12.5	10.0	5.7	2.8	0	1.2	3.3	5.7
MD 337 (Suitland Pkwy)	I-495 Exit 9	45.8	43.5	41.9	41.0	39.2	38.0	36.9	34.4	30.7	22.6	21.0	15.6	13.1	8.8	5.9	3.1	0	2.1	4.4
MD 5 (Branch Ave)	I-495 Exit 7	50.3	48.0	46.4	45.5	43.7	42.5	41.4	38.9	35.2	27.1	25.5	20.1	17.7	13.3	10.5	7.6	4.5	0	2.4
MD 414 (St Barnabas Rd)	I-495 Exit 4	53.4	51.0	49.4	48.6	46.7	45.6	44.5	41.9	38.3	30.1	28.5	23.2	20.7	16.4	13.5	10.7	7.6	3.1	0

APPENDIX F:

Existing and Future Travel Demand

Existing Travel Demand

I-495 2017 Existing Demand	AM Peak								PM Peak							
	Inner Loop				Outer Loop				Inner Loop				Outer Loop			
	6-7 AM	7-8 AM	8-9 AM	9-10AM	6-7 AM	7-8 AM	8-9 AM	9-10AM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN VA-193 AND GW MEMORIAL PKWY	7530	8145	7535	7050	5695	6730	6880	6180	6820	6730	6960	5800	5780	6075	5650	5505
AMERICAN LEGION BRIDGE	8060	9490	9175	8610	7795	9115	8950	8240	8555	8475	8670	7450	8285	8635	8415	7910
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7390	8785	8430	7940	7615	8565	7900	7320	7775	7365	7285	6465	7270	7295	7150	6855
BETWEEN MD 190 AND I-270	7210	8935	8990	8490	9025	10180	9130	8470	8580	8905	8515	7515	7575	7780	7625	6915
BETWEEN I-270 WEST AND MD 187	4090	4455	4090	4015	3640	4605	4070	4050	3720	3770	3575	2795	4250	4185	4165	3750
BETWEEN I-270 EAST AND MD 187	3850	4145	3805	3865	3475	4325	3810	3890	3590	3645	3445	2640	3990	3970	4015	3385
BETWEEN MD 355 AND MD 185	6195	8120	7435	6915	6295	7745	8235	7715	7285	7440	7055	5950	7985	7830	7975	7350
BETWEEN MD 185 AND MD 97	5735	7780	7550	6815	7545	8225	8090	8040	8280	8355	7820	6695	7800	7890	7975	7245
BETWEEN MD 97 AND US 29	5465	7445	7250	6705	8990	8525	6900	7315	8645	8665	7975	6730	7435	7780	7980	6960
BETWEEN MD US 29 AND MD 193	5420	7060	6965	6365	8085	7320	5910	6220	8160	8385	7695	6360	6780	7165	7245	6140
BETWEEN MD 193 AND MD 650	5715	7475	7465	6630	7855	6910	5595	6015	8200	8505	7975	6800	7005	7440	7765	6490
BETWEEN MD 650 AND I-95	7030	8495	7905	6995	8415	7415	6370	6630	8785	9115	8500	7455	7360	7920	8165	6930
BETWEEN US 1 AND I-95	6615	7590	7215	6535	7600	7885	7095	6665	6470	7170	6745	4995	8755	9280	8835	7530
BETWEEN GREENBELT STATION AND US 1	7180	8720	8460	7450	7895	8340	7275	6575	7660	8115	7745	6380	8175	8655	7985	6905
BETWEEN GREENBELT STATION AND MD 201	6850	8240	8085	7285	7865	8285	7220	6535	7585	7990	7640	6280	8010	8340	7450	6425
BETWEEN MD 201 AND MD 295	6420	7590	7860	7040	8390	9155	7950	7130	7550	8020	7630	6400	8140	8680	7875	6140
BETWEEN MD 295 AND MD 450	5830	6830	7245	6395	8445	9080	8045	7480	7750	8250	7795	6105	7250	7455	6845	5740
BETWEEN MD 450 AND US 50	6300	7190	7890	6960	8625	9330	8520	7895	8335	8900	8445	6835	7785	8005	7400	6205
BETWEEN US 50 AND MD 202	7195	7975	8610	7685	8035	8855	7815	7370	8555	9010	9040	7480	7845	8115	7485	6330
BETWEEN MD 202 AND ARENA DR	7100	7620	8205	7385	7800	8600	7625	7085	8180	8605	8640	7475	7825	8105	7580	6530
BETWEEN ARENA DR AND MD 214	7100	7665	8045	7305	7880	8665	7800	7060	8180	8380	8305	7310	7735	8010	7550	6490
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7060	7515	7560	7055	7530	8705	7730	6770	7740	8310	8205	7135	7765	8170	7820	6750
BETWEEN RITCHIE MARLBORO AND MD 4	7190	7610	7540	7130	6645	7725	7020	6590	6320	6885	7300	6740	7760	8110	7820	6650
BETWEEN MD 4 AND FORESTVILLE RD	6805	6695	7290	6495	5860	7065	6240	5825	5770	6680	6870	6540	7435	7460	7390	6230
BETWEEN FORESTVILLE AND MD 218	6065	6080	6635	5945	5210	6010	5235	5145	5290	6185	6405	5985	6435	6360	6300	5400
BETWEEN MD 218 AND MD 5	6260	6290	6885	6185	5905	6745	5905	5530	5770	6830	6965	6420	6775	6730	6705	5770
BETWEEN MD 5 AND MD 414	6740	5475	6050	5620	4670	5525	4900	4550	4790	5710	5880	5230	6795	6720	6695	5835
BETWEEN MD 414 AND MD 210	7125	5595	6035	5465	4580	5315	4835	4440	4585	5455	5635	4835	7185	7375	7350	6395
BETWEEN MD 210 AND I-295	8265	6560	6740	5860	4400	5195	4610	4170	4765	5740	5785	4975	7330	7575	7585	6705
WOODROW WILSON BRIDGE	10145	9835	9440	7105	7480	8625	7880	6840	7105	8415	8315	7330	9135	9190	9340	8585

I-270 2017 Existing Demand	AM Peak								PM Peak							
	Southbound				Northbound				Southbound				Northbound			
	6-7 AM	7-8 AM	8-9 AM	9-10AM	6-7 AM	7-8 AM	8-9 AM	9-10AM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN MD 85 AND MD 80	3160	3290	3085	2895	1575	2540	2665	2270	1990	2360	2730	2560	3960	4625	4445	3575
BETWEEN MD 80 AND MD 109	3435	3730	3375	3155	1380	2155	2320	2015	1835	2215	2535	2360	3785	4555	4540	3655
BETWEEN MD 109 AND MD 121	3875	4220	3790	3460	1445	2215	2365	2065	1935	2315	2650	2410	3835	4630	4645	3860
BETWEEN MD 121 AND MD 27	4950	5000	4460	4105	1695	2390	2505	2280	2320	2700	3130	2830	4300	5200	5280	4575
BETWEEN MD 27 AND MD 118	5870	5070	4555	4535	1695	2390	2505	2280	2780	3120	3300	3225	4300	5200	5280	4575
BETWEEN MD 118 AND MIDDLEBROOK RD	6415	5580	5185	4990	1985	2975	3450	3190	3285	3700	3905	3800	6270	6945	7025	6325
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	8235	7380	6790	6335	2330	3665	4315	3940	4190	4595	5020	4770	7555	8250	8340	7705
BETWEEN WATKINS MILL AND MD 124	8235	7380	6790	6335	2330	3665	4315	3940	4190	4595	5020	4770	7555	8250	8340	7705
BETWEEN MD 124 AND MD 117	9175	7965	7305	6555	2260	3680	4485	4155	4510	4930	5350	4995	8095	9170	9240	8600
BETWEEN MD 117 AND I-370	10840	9800	9015	8055	2770	4580	5895	5325	5795	6565	7050	6270	9840	10715	10610	9910
BETWEEN I-370 AND SHADY GROVE RD	9585	9715	8905	8330	2435	3890	5110	4865	5615	5865	6320	5910	10030	10995	10445	9960
BETWEEN SHADY GROVE RD AND MD 28	9590	9225	8310	7835	3035	4775	6460	6010	6135	6565	7305	6495	10220	10985	10465	9870
BETWEEN MD 28 AND MD 189	10255	10090	9065	8640	3455	5610	7825	7195	6915	7330	8120	7340	10565	11580	11215	10605
BETWEEN MD 189 AND MONTROSE RD	10285	10285	9295	8795	3545	5625	7895	7270	6685	7110	7720	7115	10530	11540	11455	10845
BETWEEN MONTROSE RD AND I-270 SPLIT	9345	10825	10005	9095	4220	6110	8295	7540	6690	7310	7535	6900	10460	11425	11440	10655
BETWEEN I-270 SPLIT AND MD 187	3800	5160	4735	4085	1835	2600	3935	3460	3280	3450	3475	3415	4600	5130	5150	4930
BETWEEN MD 187 AND I-495	3305	4485	3975	3595	2350	3340	4440	3845	3480	3665	3625	3370	4065	4300	4350	4465
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	5545	5665	5270	5010	2385	3510	4360	4080	3410	3860	4060	3485	5860	6295	6290	5725
BETWEEN DEMOCRACY BLVD AND I-495	5385	5575	5060	4420	2750	4085	4900	4475	3325	3595	3460	3165	4860	5135	4940	4720

	Ramp Description		Ramp Volumes									
			5-6 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	7-8 PM
Ramp #	From	To	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)
101	I-495 WB	I-270 NB	1156	2170	2860	2525	2640	2984	3280	3101	3043	3190
102	MD 355 NB	I-270 NB	54	207	647	834	607	1205	1232	1208	1087	776
103	I-270 NB	MD 187	142	241	416	493	437	311	353	319	365	257
104	I-270 NB	Rockledge Blvd	101	275	494	638	570	161	203	203	182	118
105	Rockledge Blvd	I-270 NB	35	121	398	693	624	1282	1525	2997	2564	1299
111	I-270 NB Spur	I-270 NB	987	2049	3492	4478	4403	5997	5389	5465	5389	5693
112	I-270 NB	Montrose Rd	176	403	647	731	680	504	361	319	336	479
113	Montrose Rd EB	I-270 NB	25	53	221	398	324	402	312	271	254	193
114	I-270 NB	Montrose Rd WB	115	197	274	360	269	302	245	254	269	307
115	Montrose Rd/Tower Oaks Blvd	I-270 NB	109	241	642	937	780	1385	1548	1384	1216	927
116	I-270 NB	MD 189	81	252	512	679	652	701	682	629	706	756
117	MD 189	I-270 NB	51	151	344	621	599	855	911	1007	874	567
118	I-270 NB	MD 28 EB/Nelson St	40	86	258	399	384	328	344	364	374	278
119	MD 28 EB	I-270 NB	14	36	82	86	67	113	110	123	72	62
120	I-270 NB	MD 28 WB	75	211	378	429	415	665	619	607	504	472
121	MD 28 WB	I-270 NB	87	192	358	471	427	750	707	707	584	532
122	I-270 NB	Shady Grove Rd/Redland Blvd	514	835	1352	1846	1745	2284	2400	2327	1953	1387
123	Shady Grove Rd EB	I-270 NB	29	87	231	289	289	514	537	519	346	294
124	Shady Grove Rd WB	I-270 NB	27	68	177	285	292	584	631	699	516	401
125	I-270 NB	I-370	265	551	958	1337	1268	2450	2440	2181	2184	1932
126	I-370 EB	I-270 NB	51	145	354	451	429	600	733	990	731	627
127	I-370 WB	I-270 NB	328	805	1459	1791	1440	1491	1572	1583	1492	1137
128	I-270 NB	MD 117	237	521	919	1441	1194	1473	1477	1396	1339	1195
129	I-270 NB	MD 124 EB	158	375	692	948	909	1581	1699	1798	1719	1284
130	MD 124 EB	I-270 NB	77	179	325	364	338	536	427	427	389	389
131	MD 124 WB	I-270 NB	123	234	350	350	318	409	325	344	376	422
132	I-270 NB	Middlebrook Rd EB	62	121	236	337	319	484	420	419	496	474
133	I-270 NB	Middlebrook Rd WB	78	173	404	480	382	801	785	796	888	820
134	I-270 NB	MD 118 EB	39	90	200	331	303	417	439	401	343	307
135	I-270 NB	MD 118 WB	129	235	511	638	557	662	596	646	702	741
136	MD 118	I-270 NB	134	239	396	426	350	421	548	593	501	378
137	I-270 NB	Father Hurley Blvd/Ridge Road	113	300	495	655	654	1679	1364	1460	1614	1488
138	Father Hurley Blvd/Ridge Road EB	I-270 NB	53	152	159	162	167	169	271	306	203	183
139	Father Hurley Blvd/Ridge Road WB	I-270 NB	42	84	130	135	129	156	208	242	168	129
140	I-270 NB	MD 121	119	238	283	352	348	726	703	786	740	590
141	MD 121	I-270 NB	29	94	238	209	163	285	227	205	150	126
142	I-270 NB	MD 109	46	89	117	108	116	204	207	254	295	301
143	MD 109	I-270 NB	18	29	60	85	76	140	148	132	93	58
144	I-270 NB	MD 80	-	124	199	238	169	467	522	596	542	-
145	MD 80	I-270 NB	96	264	583	590	401	610	566	527	451	326
146	I-270 NB	Scenic View	2	5	9	14	16	19	26	23	19	13
146	Scenic View	I-270 NB	2	5	9	14	16	19	26	23	19	13
147	I-270 NB	MD 85 NB	57	115	203	248	248	345	318	309	323	274
148	I-270 NB	MD 85 SB	48	119	206	227	164	161	161	193	180	159
149	MD 85	I-270 NB	268	480	778	783	789	1443	1568	1624	1419	1141
150	I-270 NB	I-70	441	754	1013	982	1028	2336	2386	2240	1623	1461
151	I-70 WB	I-270 NB	197	455	879	848	909	1167	1227	1288	1121	773

Ramp #	Ramp Description		Ramp Volumes									
			5-6 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	7-8 PM
	From	To	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)
201	I-270 SB	I-70 WB	51	124	230	230	193	442	483	446	313	271
202	I-270 SB	I-70 EB	788	1173	1291	1106	955	1140	1190	1073	872	670
203	I-70 WB	I-270 SB	143	174	226	334	365	278	291	317	226	156
204	I-70 EB	I-270 SB	2035	1669	1875	1829	1463	960	1074	1143	960	732
205	I-270 SB	MD 85 SB	616	1260	1526	1456	868	826	728	798	630	476
206	I-270 SB	MD 85 NB	103	229	255	233	240	225	214	218	225	181
207	MD 85	I-270 SB	164	276	263	263	259	237	259	268	255	203
208	I-270 SB	MD 80	165	154	206	247	257	381	391	483	375	329
209	MD 80	I-270 SB	527	614	747	678	458	197	243	336	237	133
210	I-270 SB	MD 109	28	46	41	64	73	72	73	75	55	45
211	MD 109	I-270 SB	558	723	732	620	438	204	191	193	153	137
212	I-270 SB	MD 121	111	165	245	260	172	177	220	307	199	175
213	MD 121	I-270 SB	907	1204	873	767	740	402	429	573	413	308
214	I-270 SB	Father Hurley Blvd/Ridge Road	166	436	1119	1316	846	331	377	437	332	239
215	Father Hurley Blvd/Ridge Road WB	I-270 SB	731	935	678	626	791	493	514	565	514	339
216	Father Hurley Blvd/Ridge Road EB	I-270 SB	115	196	181	171	154	100	108	129	102	81
217	I-270 SB	MD 118	190	231	416	420	444	304	350	479	348	239
218	MD 118 WB	I-270 SB	141	276	357	419	322	310	329	432	299	194
219	MD 118 EB	I-270 SB	346	510	581	643	588	511	616	663	481	376
220	Middlebrook Rd	I-270 SB	919	1897	1919	1713	1415	947	922	1136	901	674
221	I-270 SB	MD 124	481	624	881	909	1053	843	871	1023	869	673
222	MD 124	I-270 SB	891	1578	1272	1228	1075	1167	1211	1409	1097	789
223	MD 117	I-270 SB	856	1655	1843	1756	1555	1303	1656	1901	1337	834
224	I-270 SB	I-370 WB	219	238	451	668	553	454	573	759	570	381
225	I-270 SB	I-370 EB	1075	1455	2044	2235	1726	1543	1923	2025	1458	906
226	I-370	I-270 SB	1117	2355	2419	2416	2162	1626	1768	1579	1401	1120
227	I-270 SB	Shady Grove Rd/Fields Rd/Omega Dr	293	644	794	1137	1002	523	505	547	460	309
228	Shady Grove Rd WB	I-270 SB	144	370	446	423	431	514	544	575	461	302
229	Shady Grove Rd EB	I-270 SB	34	123	250	300	285	393	493	599	363	211
230	I-270 SB	MD 28	156	366	367	517	751	516	483	605	502	372
231	MD 28 WB	I-270 SB	63	130	201	198	224	287	231	224	210	176
232	MD 28 EB	I-270 SB	429	1194	1568	1474	1456	1157	1194	1400	1213	747
233	I-270 SB	MD 189	209	422	564	767	937	714	793	972	765	497
234	MD 189	I-270 SB	179	532	1125	1057	749	628	554	585	524	430
235	I-270 SB	Montrose Rd WB	28	68	83	88	103	152	164	209	167	100
236	Montrose Rd WB	I-270 SB	318	602	783	829	670	806	636	624	545	522
237	I-270 SB	Montrose Rd EB	369	664	664	836	1033	763	812	959	775	492
238	Montrose Rd EB	I-270 SB	108	312	715	744	555	438	425	450	396	332
239	I-270 SB	I-270 SB Spur	2462	4308	4252	4028	4028	3524	2965	2462	2238	2294
240	I-270 SB	Rockledge Blvd/MD 187	289	750	1231	1336	1002	570	643	759	531	282
241	Rockledge Blvd	I-270 SB	23	75	121	92	111	301	360	416	295	196
242	MD 187	I-270 SB	49	152	321	328	285	385	380	378	319	289
243	I-270 SB	MD 355 SB	599	1040	1017	825	859	497	554	746	938	384
244	I-270 SB	I-495 EB	1367	2443	2635	2770	2512	2761	2873	3299	2714	2481

	Ramp Description		Ramp Volumes									
			5-6 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	7-8 PM
Ramp #	From	To	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)
301	I-495	Clara Barton Pkwy	367	686	716	776	822	793	1186	1463	1007	608
302	Clara Barton Pkwy EB	I-495	17	30	108	117	89	188	71	45	72	79
303	I-495	MD 190	284	662	851	905	875	480	449	655	666	576
304	Cabin John Pkwy WB	I-495	29	65	238	297	232	888	1195	1037	1001	810
305	MD 190 WB	I-495	123	416	981	1427	1235	1279	1115	1056	958	807
306	I-495	I-270 Spur NB	1074	2363	3938	5155	4868	5298	4296	4009	4367	5083
307	I-495	MD 187	202	439	644	657	435	428	376	458	489	342
308	MD 187	I-495	48	153	310	321	267	277	287	338	293	281
309	I-495	MD 355 SB	260	502	475	382	423	318	273	275	279	247
310	I-270 SB	I-495	1367	2443	2635	2770	2512	2761	2873	3299	2714	2481
311	MD 355 SB	I-495	250	575	998	1089	834	749	752	858	678	680
312	MD 355 NB	I-495	53	126	218	235	200	412	336	299	228	229
313	I-495	MD 185	296	786	1044	1014	1034	768	779	921	1004	885
314	MD 185 SB	I-495	76	134	178	234	195	346	303	270	205	133
315	MD 185 NB	I-495	131	395	827	895	709	1669	1588	1613	1585	980
316	I-495	MD 97 SB	508	938	1113	1203	890	449	505	627	708	698
317	MD 97 SB	I-495	417	661	831	767	621	725	677	636	635	577
318	I-495	MD 97 NB	91	259	335	305	318	244	266	329	440	464
319	MD 97 NB	I-495	162	311	531	497	468	650	662	629	552	401
320	I-495	US 29 SB	21	62	150	182	224	150	112	122	159	183
321	I-495	US 29 NB	138	302	779	834	734	918	929	951	1096	1094
322	US 29 NB	I-495	81	221	491	735	521	835	1058	1045	938	656
323	I-495	MD 193 EB	205	383	534	507	427	641	587	614	561	525
324	MD 193 EB	I-495	208	327	450	462	383	338	349	310	298	293
325	MD 193 WB	I-495	148	262	288	305	227	257	318	318	314	318
326	I-495	MD 650 SB	331	515	662	644	570	570	634	570	496	441
327	MD 650 SB	I-495	420	639	657	648	622	669	678	584	568	507
328	I-495	MD 650 NB	140	325	533	757	593	299	298	300	330	310
329	MD 650 NB	I-495	636	1071	856	660	437	408	418	296	430	302
330	I-495	I-95 NB/Park and Ride Lot	2017	3151	3287	3032	2623	3435	3304	3484	3523	3169
331	I-95 SB (to US 1)	I-495	160	301	549	669	426	305	372	382	326	254
332	Park and Ride Lot	I-495	64	102	114	113	116	100	98	72	35	15
333	I-95 SB	I-495	1298	2928	2921	2593	2961	2020	1253	1526	1887	2173
334	I-495	US 1 SB	222	468	714	901	784	796	796	784	761	585
335	US 1 SB	I-495	182	342	529	477	336	374	347	323	359	342
336	I-495	US 1 NB	328	351	337	370	359	415	458	467	406	342
337	US 1 NB	I-495	178	335	521	550	414	432	472	480	405	325
338	I-495	Greenbelt Metro Station	152	337	488	381	169	77	100	109	104	53
339	I-495	MD 201	335	796	1090	1132	1090	838	908	992	852	629
340	MD 201 SB	I-495	174	333	447	464	436	605	648	676	543	368
341	MD 201 NB	I-495	164	333	413	439	385	720	766	640	498	400
342	I-495	MD 295 SB	1361	1490	1501	1324	1457	1330	1380	1441	1473	1339
343	MD 295 SB	I-495	680	1113	1025	1293	1310	1539	1302	1147	1204	916
344	I-495	MD 295 NB	238	401	563	726	690	330	241	242	362	455
345	MD 295 NB	I-495	13	19	28	27	29	39	28	24	31	32
346	I-495	MD 450	249	533	751	744	561	590	544	532	664	648
347	MD 450	I-495	643	1011	1166	1200	1032	1183	1203	1192	1097	991
348	I-495	US 50 EB	494	937	1304	1386	1179	1822	2020	2007	1798	1280
349	I-495	US 50 WB	507	407	334	280	413	288	259	242	258	243
350	US 50	I-495	1471	2604	2850	2791	2612	2445	2398	2662	2323	2046
351	I-495	MD 202 WB	116	250	359	387	346	327	299	288	320	284
352	I-495	MD 202 EB	130	342	715	959	762	817	877	993	825	617
353	MD 202	I-495	136	307	440	454	367	592	609	579	562	484
354	I-495	Arena Dr	95	173	233	404	321	372	720	875	506	310
355	Arena Dr	I-495	40	79	145	145	138	241	287	313	244	178
356	I-495	MD 214 WB	315	607	767	865	639	685	604	571	576	534
357	I-495	MD 214 EB	203	253	597	681	675	529	488	642	735	626
358	MD 214	I-495	434	813	1129	1033	835	891	984	941	999	920
359	I-495	Ritchie Marlboro Rd	223	445	618	655	544	1002	1113	1076	915	705
360	Ritchie Marlboro Rd	I-495	316	643	949	785	545	698	654	600	600	469
361	I-495	MD 4 WB	507	1132	1532	870	921	800	744	778	853	848
362	MD 4 WB	I-495	685	831	914	831	548	521	512	457	320	210
363	I-495	MD 4 EB	451	851	755	597	667	910	866	805	819	744
364	MD 4 EB	I-495	264	427	523	429	408	610	593	614	610	560
365	I-495	Forestville Rd	256	510	620	635	528	477	486	521	552	430
366	Suitland Rd	I-495	118	223	197	207	216	472	674	581	409	242
367	I-495	MD 5 SB/MD 535	734	1527	2416	2211	1927	2328	2423	2510	2520	2313
368	MD 5 NB/MD 535	I-495	1698	1749	1068	887	877	1067	1080	1030	886	709
369	MD 5 SB	I-495	59	100	157	150	106	197	202	246	229	142
370	I-495	MD 414 (St. Barnabas Rd)/Alice Ave	98	278	448	414	318	306	300	348	364	314
371	MD 414 (St. Barnabas Rd) NB	I-495	446	614	410	303	303	341	284	313	236	231
372	I-495	MD 414 (St. Barnabas Rd) SB	267	308	404	473	453	655	692	705	701	506
373	MD 414 (St. Barnabas Rd) SB	I-495	348	550	513	469	312	420	455	498	438	345
374	I-495	MD 210	291	711	441	436	537	488	549	602	536	420
375	MD 210 NB (Loop Ramp)	I-495	1096	1430	1042	962	855	588	655	655	574	481
376	MD 210 SB	I-495	137	331	216	207	234	256	282	309	278	198
377	MD 210 NB (Flyover Ramp)	I-495	241	473	563	392	221	282	372	352	277	241
378	I-495	I-295 NB	1044	786	352	442	722	389	330	318	346	355
379	National Harbor Blvd WB	I-495	364	1055	1052	1159	545	714	1004	992	690	628
380	I-495	National Harbor Blvd EB	99	88	62	104	213	306	310	276	321	373
381	I-295 SB	I-495	461	719	1150	1079	893	2158	1998	1708	1889	1525

	Ramp Description		Ramp Volumes									
			5-6 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	7-8 PM
Ramp #	From	To	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)	Volume (vph)
401	I-495	I-295 NB/National Harbor Blvd SB	393	507	703	725	812	1732	1797	1860	2148	1939
402	I-495	MD 210 SB/Harborview Ave	139	238	352	314	342	1078	732	932	870	749
403	I-295 SB/National Harbor Blvd NB	I-495	173	361	600	628	544	1667	1738	1536	1570	1257
404	I-495	MD 414 (Oxon Hill Rd)	132	243	294	324	314	821	923	933	973	771
405	MD 414 (Oxon Hill Rd)	I-495	574	580	706	741	854	903	845	820	832	690
406	I-495	MD 414 (St. Barnabas Rd)	55	98	156	209	215	370	373	482	347	271
407	MD 414 (St. Barnabas Rd) SB	I-495	116	180	274	251	235	194	185	211	222	219
408	I-495	MD 414 (St. Barnabas Rd) NB	196	427	481	542	403	494	688	697	595	376
409	MD 414 (St. Barnabas Rd) NB	I-495	220	450	726	597	560	597	661	680	560	413
410	I-495	MD 5 EB	305	646	825	789	754	1453	1561	1525	1471	1130
411	MD 5 EB	I-495	220	373	432	396	381	525	497	510	526	454
412	I-495	MD 5 WB	92	260	423	418	299	282	302	350	291	273
413	MD 5 WB	I-495	1551	1787	1818	1713	1536	1192	1056	1049	1161	1193
414	I-495	MD 337	268	568	809	514	313	356	387	488	413	241
415	MD 337	I-495	266	664	1034	913	789	1004	1107	1093	838	663
416	I-495	MD 4 EB	359	504	491	482	506	838	796	750	705	580
417	MD 4 EB	I-495	361	570	687	528	535	852	815	835	779	666
418	I-495	MD 4 WB	251	355	711	651	551	627	546	626	674	618
419	MD 4 WB	I-495	713	991	1039	979	810	773	798	701	556	399
420	I-495	Ritchie Marlboro Rd	320	471	663	721	643	687	793	819	772	699
421	Ritchie Marlboro Rd	I-495	477	987	1419	987	676	599	599	499	488	355
422	I-495	MD 214	285	561	978	1006	962	1183	1313	1348	1218	920
423	MD 214 EB	I-495	336	491	625	593	572	766	760	657	478	383
424	MD 214 WB	I-495	287	525	606	457	404	329	273	263	335	322
425	I-495	Arena Dr	194	381	499	703	601	625	661	704	741	612
426	Arena Dr	I-495	30	93	169	188	182	231	241	268	268	198
427	I-495	MD 202	386	732	1080	1213	824	979	1101	1218	1002	711
428	MD 202 EB	I-495	132	171	176	222	138	231	195	149	144	180
429	MD 202	I-495	497	890	1239	1188	1003	1176	1288	1279	987	822
430	I-495	US 50 EB	543	851	1031	1078	1120	1811	1884	1653	1524	1170
431	I-495	US 50 WB	836	958	967	866	934	709	668	757	827	668
432	US 50	I-495	1495	2393	2664	2500	2449	2426	2307	2295	1962	1655
433	I-495	MD 450 EB	208	533	752	784	702	808	929	963	785	774
434	I-495	MD 450 WB	84	191	202	283	257	325	330	307	408	331
435	MD 450	I-495	620	792	894	731	586	788	812	860	716	655
436	I-495	MD 295 NB/MD 193 EB	1204	1619	1515	1547	1626	1187	1181	1132	1407	1261
437	MD 295	I-495	707	995	1187	1126	893	1364	1279	1055	1176	1225
438	I-495	MD 295 SB	16	23	27	37	52	50	42	37	44	58
439	MD 295 SB	I-495	424	566	608	536	477	636	739	749	587	439
440	I-495	MD 201	683	1093	1486	1572	1162	991	991	1059	974	666
441	MD 201 NB	I-495	482	691	603	519	483	935	1061	1078	835	600
442	MD 201 SB	I-495	76	118	135	126	131	179	207	279	191	125
443	I-495	Greenbelt Metro Station	12	30	58	55	39	167	321	548	489	207
444	I-495	US 1	277	651	1150	1080	720	789	845	859	831	679
445	US 1 NB	I-495	92	260	423	418	299	282	302	350	291	273
446	US 1 SB	I-495	207	347	347	380	389	595	595	546	521	438
447	I-495	I-95 NB/Park and Ride Lot	1046	2364	3711	3825	2683	4050	4391	4481	3886	3334
448	Park and Ride Lot	I-495	49	61	97	89	95	67	50	34	14	10
449	I-95 SB	I-495	2600	3093	2286	1928	1614	2959	3093	3093	2600	2197
450	I-495	MD 650 NB	307	540	635	689	703	713	773	850	733	604
451	MD 650 NB	I-495	326	262	319	236	224	500	476	557	487	444
452	I-495	MD 650 SB	363	660	663	750	650	870	916	879	900	737
453	MD 650 SB	I-495	190	317	415	330	395	552	629	692	478	302
454	I-495	MD 193 WB	203	360	350	390	405	679	764	846	826	716
455	MD 193 WB	I-495	525	740	597	565	438	509	478	366	366	366
456	US 29 NB	I-495	9	41	104	226	331	185	212	258	241	214
457	I-495	US 29 SB	210	403	377	352	517	414	379	409	461	424
458	US 29 SB	I-495	551	1266	1475	1265	1277	879	794	882	941	703
459	I-495	MD 97	472	435	287	365	596	889	1145	1264	1056	804
460	MD 97 NB	I-495	214	470	1041	1285	873	923	896	865	911	693
461	MD 97 SB	I-495	266	544	918	1060	722	471	390	320	335	364
462	I-495	MD 185	1160	1765	1452	1512	1596	877	1015	1109	1020	694
463	MD 185 NB	I-495	78	235	653	975	683	843	771	789	717	542
464	MD 185 SB	I-495	280	540	721	724	588	429	384	320	306	279
465	I-495	MD 355 NB	522	723	838	832	904	836	990	1061	839	662
466	I-495	I-270 NB	1156	2170	2860	2525	2640	2984	3280	3101	3043	3190
467	MD 355 NB	I-495	88	199	389	402	341	486	324	268	203	231
468	I-495	MD 187	124	327	467	497	432	342	490	546	409	264
469	MD 187	I-495	112	223	406	492	417	515	588	575	461	335
470	I-270 Spur SB	I-495	3017	4988	4926	4434	4495	4003	2833	2217	2155	2771
471	MD 190 WB	I-495	90	250	423	653	532	626	597	554	615	470
472	I-495	MD 190	364	832	1125	1004	978	810	679	773	937	669
473	MD 190 EB	I-495	107	459	705	630	556	289	251	246	219	150
474	I-495	Cabin John Pkwy	902	1523	925	1042	1335	246	152	141	152	363
475	I-495	Clara Barton Pkwy WB	180	183	162	101	114	58	34	27	72	57
476	Clara Barton Pkwy	I-495	85	264	695	1304	1049	1092	1401	1317	945	432

2025 No-Build Travel Demand

I-495 2025 No-Build Demand	AM Peak								PM Peak							
	Inner Loop				Outer Loop				Inner Loop				Outer Loop			
	6-7 AM	7-8 AM	8-9 AM	9-10AM	6-7 AM	7-8 AM	8-9 AM	9-10AM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN VA-193 AND GW MEMORIAL PKWY	7930	8445	7900	7485	5695	6730	6880	6180	7150	6980	7215	6165	6045	6285	5865	5800
AMERICAN LEGION BRIDGE	8060	9490	9175	8610	7795	9115	8950	8240	8920	8760	8965	7850	8650	8945	8735	8300
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7785	9055	8765	8350	8050	8850	8145	7695	8065	7565	7475	6745	7555	7510	7375	7160
BETWEEN MD 190 AND I-270	7585	9200	9310	8890	9480	10490	9380	8855	8925	9155	8740	7825	7845	7985	7835	7195
BETWEEN I-270 WEST AND MD 187	4350	4555	4195	4230	3920	4705	4150	4295	3905	3850	3635	2930	4375	4275	4225	3855
BETWEEN I-270 EAST AND MD 187	4100	4230	3900	4065	3755	4430	3890	4135	3770	3720	3495	2765	4105	4055	4070	3480
BETWEEN MD 355 AND MD 185	6530	8305	7615	7210	6635	7920	8420	8105	7560	7615	7200	6165	8170	7980	8130	7545
BETWEEN MD 185 AND MD 97	6060	7930	7710	7085	7800	8400	8360	8375	8550	8520	7950	6900	7960	8020	8145	7415
BETWEEN MD 97 AND US 29	5635	7550	7365	6890	9190	8650	7130	7525	8905	8815	8085	6915	7600	7890	8120	7100
BETWEEN MD US 29 AND MD 193	5515	7145	7065	6530	8235	7385	6005	6365	8450	8515	7780	6525	6905	7260	7335	6250
BETWEEN MD 193 AND MD 650	5855	7575	7585	6810	8000	6965	5680	6160	8545	8700	8070	6980	7145	7570	7850	6610
BETWEEN MD 650 AND I-95	7175	8610	8035	7205	8575	7480	6445	6785	9140	9275	8605	7635	7500	8055	8255	7060
BETWEEN US 1 AND I-95	6775	7745	7385	6800	7750	7995	7215	6855	6450	7200	6820	5105	8960	9480	8945	7705
BETWEEN GREENBELT STATION AND US 1	7475	8895	8655	7780	8130	8480	7370	6765	7665	8160	7835	6515	8365	8835	8080	7060
BETWEEN GREENBELT STATION AND MD 201	7125	8530	8315	7455	8230	8640	7495	6860	7675	8140	7810	6505	8700	9350	8605	6900
BETWEEN MD 201 AND MD 295	6635	7750	8025	7275	8540	9315	8105	7345	7560	8075	7725	6545	8295	8845	8020	6330
BETWEEN MD 295 AND MD 450	6020	6960	7380	6600	8585	9230	8190	7690	7755	8290	7870	6225	7380	7585	6960	5910
BETWEEN MD 450 AND US 50	6460	7325	8040	7150	8760	9480	8670	8115	8340	8945	8530	6970	7930	8165	7510	6370
BETWEEN US 50 AND MD 202	7380	8125	8770	7885	8220	8990	7935	7575	8550	9035	9125	7620	8000	8280	7600	6490
BETWEEN MD 202 AND ARENA DR	7270	7780	8375	7600	7930	8760	7775	7280	8180	8635	8735	7635	7990	8290	7720	6700
BETWEEN ARENA DR AND MD 214	7265	7840	8230	7535	8020	8870	7995	7345	8200	8430	8420	7485	7915	8210	7710	6675
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7245	7710	7755	7295	7695	8930	7935	7060	7765	8380	8340	7330	7965	8400	8015	6980
BETWEEN RITCHIE MARLBORO AND MD 4	7380	7820	7740	7380	6790	7920	7195	6770	6320	6945	7440	6930	7965	8345	8020	6870
BETWEEN MD 4 AND FORESTVILLE RD	6975	6885	7490	6730	6030	7240	6385	5975	5755	6740	7000	6730	7645	7685	7590	6435
BETWEEN FORESTVILLE AND MD 218	6215	6255	6820	6165	5310	6125	5325	5250	5260	6235	6525	6160	6595	6530	6455	5550
BETWEEN MD 218 AND MD 5	6415	6470	7075	6410	6050	6910	6040	5660	5755	6900	7100	6610	6965	6925	6885	5940
BETWEEN MD 5 AND MD 414	6900	5635	6225	5835	4790	5675	5025	4665	4755	5755	5995	5395	7025	6935	6900	6020
BETWEEN MD 414 AND MD 210	7320	5780	6230	5690	4715	5470	4970	4565	4560	5505	5755	4995	7440	7625	7595	6615
BETWEEN MD 210 AND I-295	8490	6770	6950	6090	4525	5345	4735	4285	4740	5795	5905	5135	7565	7820	7830	6915
WOODROW WILSON BRIDGE	10480	10210	9760	7465	7755	8940	8165	7090	7195	8605	8560	7605	9470	9525	9680	8900

I-270 2025 No-Build Demand	AM Peak								PM Peak							
	Southbound				Northbound				Southbound				Northbound			
	6-7 AM	7-8 AM	8-9 AM	9-10AM	6-7 AM	7-8 AM	8-9 AM	9-10AM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN MD 85 AND MD 80	3325	3450	3215	3035	1670	2675	2805	2405	2075	2480	2850	2710	4170	4865	4650	3760
BETWEEN MD 80 AND MD 109	3615	3905	3520	3305	1440	2250	2425	2105	1910	2310	2645	2495	3970	4780	4740	3835
BETWEEN MD 109 AND MD 121	4100	4435	3975	3660	1515	2320	2470	2160	2015	2420	2765	2545	4035	4870	4855	4060
BETWEEN MD 121 AND MD 27	5195	5260	4685	4360	1815	2510	2635	2410	2445	2835	3285	3020	4540	5495	5555	4840
BETWEEN MD 27 AND MD 118	6110	5310	4770	4790	1815	2510	2635	2410	2935	3280	3460	3425	4540	5495	5555	4840
BETWEEN MD 118 AND MIDDLEBROOK RD	6660	5830	5420	5260	2120	3110	3615	3355	3460	3885	4085	4010	6590	7310	7380	6670
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	8550	7705	7100	6670	2345	3500	3915	3580	4405	4825	5250	5025	8415	9015	8860	8255
BETWEEN WATKINS MILL AND MD 124	7710	6695	5830	5445	2330	3785	4440	4060	3750	4170	4685	4435	8240	8770	8910	8260
BETWEEN MD 124 AND MD 117	9385	8210	7490	6825	2375	3880	4780	4435	4695	5130	5630	5235	8825	9695	9825	9155
BETWEEN MD 117 AND I-370	11100	10100	9250	8370	2900	4805	6235	5640	6020	6810	7375	6550	10065	11020	10990	10270
BETWEEN I-370 AND SHADY GROVE RD	9900	10080	9185	8650	2555	4100	5420	5170	5845	6090	6620	6180	10370	11405	10880	10385
BETWEEN SHADY GROVE RD AND MD 28	9900	9590	8590	8150	3175	5025	6835	6370	6410	6825	7655	6825	10590	11425	10930	10310
BETWEEN MD 28 AND MD 189	10615	10500	9410	9005	3625	5900	8260	7610	7235	7635	8515	7720	10970	12065	11730	11095
BETWEEN MD 189 AND MONTROSE RD	10630	10675	9625	9145	3705	5880	8295	7655	6970	7380	8070	7460	10925	11975	11920	11290
BETWEEN MONTROSE RD AND I-270 SPLIT	9690	11220	10355	9430	4395	6365	8680	7915	6955	7565	7850	7215	10830	11815	11855	11055
BETWEEN I-270 SPLIT AND MD 187	3945	5320	4885	4240	1895	2685	4075	3630	3385	3560	3585	3520	4745	5280	5320	5090
BETWEEN MD 187 AND I-495	3425	4610	4085	3720	2420	3435	4575	4015	3580	3770	3725	3470	4190	4420	4490	4610
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	5745	5900	5470	5195	2500	3680	4605	4285	3575	4010	4265	3695	6085	6540	6540	5965
BETWEEN DEMOCRACY BLVD AND I-495	5560	5785	5230	4560	2865	4250	5115	4660	3470	3710	3610	3340	5020	5305	5105	4895

AM Peak Travel Demand - 2045 No-Build vs. 2045 Preferred

AM Peak - I-495	2045 No-Build Demand								2045 Preferred Demand							
	Inner Loop				Outer Loop				Inner Loop				Outer Loop			
	6-7 AM	7-8 AM	8-9 AM	9-10AM	6-7 AM	7-8 AM	8-9 AM	9-10AM	6-7 AM	7-8 AM	8-9 AM	9-10AM	6-7 AM	7-8 AM	8-9 AM	9-10AM
BETWEEN VA-193 AND GW MEMORIAL PKWY	8840	9375	8895	8235	8545	9515	8930	8145	7715	8820	8460	7995	9500	10150	9720	8955
AMERICAN LEGION BRIDGE	8780	10335	10095	9350	10310	11040	9990	9250	9735	11295	10865	10365	11500	12335	11145	10320
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	8020	9520	9255	8520	10055	10255	8570	8110	9235	10740	10285	9670	11320	11670	9965	9385
BETWEEN MD 190 AND I-270	7790	9600	9750	9075	12110	12130	10010	9225	9210	11070	10865	10465	13730	13855	11740	10925
BETWEEN I-270 WEST AND MD 187	4320	5035	4300	4035	4680	5715	4455	4405	4915	5610	4645	4455	5025	6055	4860	4860
BETWEEN I-270 EAST AND MD 187	4055	4775	4085	3920	4415	5035	3925	4005	4500	5110	4400	4350	4680	5370	4330	4330
BETWEEN MD 355 AND MD 185	6785	8860	8030	7570	8360	9570	8995	8520	7120	9150	8305	7970	8520	9860	9225	8650
BETWEEN MD 185 AND MD 97	6275	8390	8090	7395	10315	10430	8955	8985	6555	8595	8220	7720	10285	10535	9025	9000
BETWEEN MD 97 AND US 29	6100	8290	7980	7400	10095	9325	7395	7955	6395	8515	8045	7630	10050	9420	7450	7960
BETWEEN MD US 29 AND MD 193	6095	7935	7760	7140	9090	8005	6310	6740	6325	8070	7725	7255	9015	8055	6320	6700
BETWEEN MD 193 AND MD 650	6410	8300	8230	7405	8860	7695	6100	6650	6635	8435	8205	7530	8810	7765	6130	6640
BETWEEN MD 650 AND I-95	7660	9195	8560	7690	9580	8365	7065	7430	7785	9225	8455	7765	9525	8435	7095	7420
BETWEEN US 1 AND I-95	7530	8680	8505	7995	8910	9100	8175	7670	7550	8660	8445	8025	8925	9185	8245	7715
BETWEEN GREENBELT STATION AND US 1	8345	9980	9975	8840	9260	9630	8460	7745	8370	9935	9930	8870	9295	9730	8555	7815
BETWEEN GREENBELT STATION AND MD 201	7910	9515	9540	8430	9320	9785	8565	7815	7935	9475	9500	8460	9355	9885	8665	7885
BETWEEN MD 201 AND MD 295	7105	8475	9010	7835	9255	10015	8775	7830	7125	8420	8950	7835	9300	10115	8880	7905
BETWEEN MD 295 AND MD 450	6275	7475	8150	6985	9215	9835	8785	8075	6300	7440	8110	7000	9280	9945	8920	8180
BETWEEN MD 450 AND US 50	6730	7805	8540	7425	9280	9985	9150	8525	6810	7845	8595	7490	9370	10135	9330	8675
BETWEEN US 50 AND MD 202	7710	8635	9295	8255	8685	9515	8465	8050	7540	8415	9125	8075	8645	9500	8470	8045
BETWEEN MD 202 AND ARENA DR	7640	8290	8925	8010	8545	9375	8385	7875	7495	8140	8790	7865	8515	9365	8405	7870
BETWEEN ARENA DR AND MD 214	7570	8245	8630	7825	8675	9490	8620	7885	7445	8115	8520	7705	8645	9480	8630	7885
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7375	7905	7925	7405	8230	9445	8430	7480	7375	7890	7935	7375	8200	9425	8425	7475
BETWEEN RITCHIE MARLBORO AND MD 4	7415	7880	7790	7395	7325	8435	7690	7290	7410	7855	7785	7360	7295	8405	7680	7280
BETWEEN MD 4 AND FORESTVILLE RD	7515	7470	7985	7210	6020	7200	6385	6015	7535	7470	7990	7190	5990	7160	6365	5995
BETWEEN FORESTVILLE AND MD 218	6840	6850	7335	6645	5380	6200	5390	5295	6845	6840	7330	6615	5350	6160	5370	5285
BETWEEN MD 218 AND MD 5	7060	7090	7610	6915	6225	7085	6225	5820	7070	7080	7610	6885	6210	7060	6215	5815
BETWEEN MD 5 AND MD 414	7645	6210	6805	6310	5110	6010	5375	4980	7620	6200	6795	6275	5085	5970	5350	4960
BETWEEN MD 414 AND MD 210	7975	6275	6695	6005	4755	5500	4970	4580	7955	6265	6685	5975	4730	5470	4950	4565
BETWEEN MD 210 AND I-295	9550	7475	7530	6500	4710	5520	4975	4530	9465	7415	7485	6435	4690	5495	4955	4515
WOODROW WILSON BRIDGE	11480	10930	10460	7955	7490	8660	7890	6880	11445	10910	10435	7905	7500	8660	7905	6895

AM Peak - I-270	2045 No-Build Demand								2045 Preferred Demand							
	Southbound				Northbound				Southbound				Northbound			
	6-7 AM	7-8 AM	8-9 AM	9-10AM	6-7 AM	7-8 AM	8-9 AM	9-10AM	6-7 AM	7-8 AM	8-9 AM	9-10AM	6-7 AM	7-8 AM	8-9 AM	9-10AM
BETWEEN MD 85 AND MD 80	4180	4280	4250	3675	2490	3695	3810	3255	4275	4345	4275	3695	2515	3665	3775	3245
BETWEEN MD 80 AND MD 109	4750	4980	4805	4165	2370	3400	3570	3085	4890	5090	4850	4215	2400	3375	3540	3080
BETWEEN MD 109 AND MD 121	5225	5505	5265	4505	2485	3525	3670	3195	5370	5625	5320	4560	2535	3505	3650	3195
BETWEEN MD 121 AND MD 27	6370	6485	6100	5365	2940	3745	3895	3545	6535	6640	6185	5435	2995	3725	3875	3545
BETWEEN MD 27 AND MD 118	7225	6480	6145	5760	3120	4065	4295	3960	7415	6695	6285	5870	3190	4065	4280	3965
BETWEEN MD 118 AND MIDDLEBROOK RD	7715	6780	6560	6065	3280	4275	4570	4465	7895	6965	6675	6165	3370	4280	4570	4485
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	9580	8595	7985	7395	3745	5010	5440	5290	9795	8815	8160	7520	3875	5050	5465	5330
BETWEEN WATKINS MILL AND MD 124	8660	7525	7255	6395	3645	5135	5770	5585	8930	7810	7500	6585	3825	5225	5845	5670
BETWEEN MD 124 AND MD 117	10305	9010	8685	7700	3600	5360	6405	5860	10610	9365	8980	7935	3795	5465	6495	5970
BETWEEN MD 117 AND I-370	12035	10930	10490	9270	4145	6315	7890	7060	12365	11310	10810	9535	4370	6440	7995	7185
BETWEEN I-370 AND SHADY GROVE RD	12830	11130	10200	9350	3850	5605	7100	6540	13605	11810	10955	10150	4240	5870	7345	6800
BETWEEN SHADY GROVE RD AND MD 28	12735	10535	9515	8780	4425	6335	8175	7525	13215	10880	9990	9290	4345	6025	7640	7000
BETWEEN MD 28 AND MD 189	13380	11570	10340	9590	5005	7230	9505	8640	14380	12510	11370	10590	5770	7855	10085	9160
BETWEEN MD 189 AND MONTROSE RD	13275	11855	10710	9870	5125	7225	9530	8695	14330	13020	11965	10990	5765	7680	10010	9090
BETWEEN MONTROSE RD AND I-270 SPLIT	12815	12615	11565	10235	5635	7455	9730	8765	13950	13700	12705	11355	6260	8010	10100	9290
BETWEEN I-270 SPLIT AND MD 187	5090	5840	5525	4865	2525	3475	4730	4125	4780	5870	5605	5020	2415	3360	4580	3935
BETWEEN MD 187 AND I-495	3910	4775	4475	4075	3300	4495	5420	4575	3780	4640	4400	4025	3190	4380	5295	4430
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	7725	6775	6045	5365	3110	3980	5005	4640	9175	7830	7095	6330	3845	4650	5520	5360
BETWEEN DEMOCRACY BLVD AND I-495	7430	6415	5560	4820	3465	4560	5450	5040	8710	7805	6880	6065	4290	5460	6220	6010

PM Peak Travel Demand - 2045 No-Build vs. 2045 Preferred

PM Peak - I-495	2045 No-Build Demand								2045 Preferred Demand							
	Inner Loop				Outer Loop				Inner Loop				Outer Loop			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN VA-193 AND GW MEMORIAL PKWY	7545	7805	7740	6420	8190	8625	8290	7815	7570	7775	7560	6365	8645	8945	8540	8085
AMERICAN LEGION BRIDGE	9185	9485	9445	8060	9730	10220	9865	9240	9525	9785	9625	8405	10565	10990	10495	10060
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	8395	8155	7860	6990	8100	8190	7970	7585	8975	8785	8375	7585	9450	9510	9125	8900
BETWEEN MD 190 AND I-270	10390	10280	9575	8565	8490	8800	8475	7660	11545	11455	10680	9685	9895	10185	9725	9010
BETWEEN I-270 WEST AND MD 187	5125	4920	4520	3870	4750	4615	4475	3920	5180	5025	4560	3900	5170	4900	4770	4205
BETWEEN I-270 EAST AND MD 187	4880	4715	4275	3540	4465	4265	4210	3545	4935	4735	4215	3595	4870	4555	4465	3795
BETWEEN MD 355 AND MD 185	8765	8820	8150	7280	8405	8450	8650	7760	8925	8810	8100	7255	8675	8550	8610	7800
BETWEEN MD 185 AND MD 97	9610	9615	8745	7760	8225	8495	8490	7510	9590	9445	8600	7685	8380	8550	8480	7545
BETWEEN MD 97 AND US 29	9955	9915	8935	7865	7970	8505	8550	7305	9880	9740	8810	7810	8175	8605	8590	7400
BETWEEN MD US 29 AND MD 193	9480	9580	8580	7355	7405	7940	7835	6510	9400	9420	8460	7300	7515	7965	7800	6520
BETWEEN MD 193 AND MD 650	9545	9825	9030	7880	7675	8275	8370	6900	9435	9630	8885	7795	7750	8280	8330	6915
BETWEEN MD 650 AND I-95	10125	10460	9605	8590	8250	8985	8915	7490	9980	10255	9450	8475	8270	8935	8815	7430
BETWEEN US 1 AND I-95	8555	9205	8205	6605	10020	10585	9775	8365	8545	8820	8195	6590	10045	10575	9760	8355
BETWEEN GREENBELT STATION AND US 1	9775	10125	9120	7505	9540	10030	9015	7855	9775	10125	9120	7505	9525	9995	8975	7825
BETWEEN GREENBELT STATION AND MD 201	9715	10020	9015	7420	9315	9695	8660	7525	9730	10030	9015	7425	9300	9665	8630	7490
BETWEEN MD 201 AND MD 295	9240	9615	8685	7225	8460	8730	7520	6440	9300	9625	8700	7225	8430	8680	7475	6395
BETWEEN MD 295 AND MD 450	9000	8955	7995	6350	7470	7420	6425	6035	9065	8970	8020	6365	7405	7335	6345	5950
BETWEEN MD 450 AND US 50	9495	9210	8620	7055	7970	7935	7155	6505	9535	9205	8620	7085	7825	7780	7010	6395
BETWEEN US 50 AND MD 202	9305	9100	8950	7660	8165	8275	7535	6905	9375	9120	8965	7660	8180	8280	7540	6905
BETWEEN MD 202 AND ARENA DR	8895	8730	8635	7650	8065	8180	7535	7045	8915	8710	8615	7625	8035	8150	7505	7005
BETWEEN ARENA DR AND MD 214	8785	8400	8220	7370	7935	8045	7445	6965	8790	8375	8195	7340	7905	8010	7415	6925
BETWEEN MD 214 AND RITCHIE MARLBORO RD	8290	8355	8180	7220	7965	8200	7850	7000	8325	8320	8150	7185	7995	8185	7835	6965
BETWEEN RITCHIE MARLBORO AND MD 4	7455	7840	8010	7050	7795	8035	7750	6765	7445	7815	7985	7020	7765	8005	7720	6720
BETWEEN MD 4 AND FORESTVILLE RD	6990	7735	7715	7085	7840	7870	7695	6595	6960	7695	7675	7050	7780	7810	7640	6525
BETWEEN FORESTVILLE AND MD 218	6540	7260	7320	6565	6685	6630	6470	5640	6500	7215	7275	6520	6625	6580	6420	5580
BETWEEN MD 218 AND MD 5	7170	8055	8020	7130	7140	7090	6955	6085	7130	8005	7975	7085	7080	7040	6905	6020
BETWEEN MD 5 AND MD 414	5885	6705	6750	5860	7145	7025	6990	6135	5820	6650	6695	5810	7075	6965	6930	6065
BETWEEN MD 414 AND MD 210	5570	6425	6485	5455	7720	7950	7900	6925	5505	6370	6430	5400	7655	7895	7845	6860
BETWEEN MD 210 AND I-295	5660	6655	6585	5580	8125	8275	8335	7360	5595	6605	6530	5530	8055	8210	8275	7295
WOODROW WILSON BRIDGE	7720	9050	8875	7700	10035	9955	10110	9345	7665	9000	8825	7660	9960	9890	10050	9275

PM Peak - I-270	2045 No-Build Demand								2045 Preferred Demand							
	Southbound				Northbound				Southbound				Northbound			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN MD 85 AND MD 80	2465	2860	3210	3000	4930	5225	4990	4060	2510	2900	3205	2970	4950	5240	5035	4150
BETWEEN MD 80 AND MD 109	2425	2865	3180	2945	5085	5360	5260	4295	2490	2925	3195	2935	5115	5395	5330	4415
BETWEEN MD 109 AND MD 121	2515	2960	3285	3000	5245	5535	5430	4555	2600	3035	3320	3000	5290	5580	5515	4700
BETWEEN MD 121 AND MD 27	3060	3455	3900	3600	5870	6310	6300	5500	3170	3560	3965	3630	6085	6525	6535	5745
BETWEEN MD 27 AND MD 118	3615	3965	4075	4035	7185	7455	7520	6915	3735	4080	4210	4070	7250	7510	7600	7010
BETWEEN MD 118 AND MIDDLEBROOK RD	3810	4295	4390	4390	7995	8030	8055	7350	3945	4415	4460	4430	8120	8155	8190	7500
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	4785	5275	5545	5465	9245	9465	9390	8715	4960	5430	5655	5510	9390	9610	9545	8830
BETWEEN WATKINS MILL AND MD 124	4375	4805	4960	4970	8670	8990	9170	8460	4630	5045	5130	5120	8780	9085	9260	8520
BETWEEN MD 124 AND MD 117	5315	5925	6230	5910	9405	9755	10000	9095	5565	6160	6395	6070	9460	9900	10135	9235
BETWEEN MD 117 AND I-370	6640	7620	7965	7235	10810	11420	11495	10485	6925	7890	8145	7410	10915	11570	11610	10630
BETWEEN I-370 AND SHADY GROVE RD	7050	7505	7790	7490	10930	11775	11425	10705	7285	7790	7950	7700	11180	12165	11690	11075
BETWEEN SHADY GROVE RD AND MD 28	7425	8045	8680	8030	11080	11635	11190	10395	7335	7945	8530	7890	10730	11475	10970	10305
BETWEEN MD 28 AND MD 189	8140	8785	9480	8835	12100	12945	12575	11755	8785	9445	10000	9380	12605	13570	13075	12355
BETWEEN MD 189 AND MONTROSE RD	7980	8660	9195	8680	11895	12705	12650	11755	8760	9350	9780	9335	12320	13290	13185	12400
BETWEEN MONTROSE RD AND I-270 SPLIT	7965	8775	8895	8545	11550	12375	12305	11380	9075	9860	9855	9560	12125	13010	12825	11995
BETWEEN I-270 SPLIT AND MD 187	3935	4150	4120	4220	5300	5830	5865	5595	4160	4255	4315	4300	4900	5515	5525	5200
BETWEEN MD 187 AND I-495	3970	4215	4120	4025	4535	4725	4790	4795	3995	4170	4110	3950	4350	4445	4490	4575
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	4030	4625	4780	4325	6255	6545	6440	5785	4910	5610	5540	5260	7220	7500	7300	6790
BETWEEN DEMOCRACY BLVD AND I-495	3740	4185	4000	3740	5260	5355	5055	4695	4725	5285	4955	4805	6365	6435	6125	5790

APPENDIX G:

Existing and Future Throughputs and Percent Demand Met

Throughput and Percent Demand Met
Existing

I-495 Existing AM Throughputs	Inner Loop				Outer Loop			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
Between VA 193 and George Washington Pwky	7,400	7,975	7,217	6,919	5,869	6,527	6,818	6,424
American Legion Bridge	7,966	8,297	8,155	8,023	8,104	8,808	9,243	8,600
Between Clara Barton Pkwy and Cabin John Pkwy	7,494	7,758	7,552	7,371	7,972	8,298	8,248	7,689
Between MD 190 and I-270	7,270	7,766	8,043	7,835	9,567	9,911	9,433	8,992
Between I-270 West and MD 187	4,347	4,387	3,813	3,727	3,788	4,615	3,899	4,240
Between I-270 East and MD 187	4,033	4,157	3,578	3,577	3,618	4,393	3,694	4,026
Between MD 355 and MD 185	6,119	7,662	7,079	6,970	6,572	7,824	8,171	7,951
Between MD 185 and MD 97	5,778	7,294	7,298	6,832	7,990	8,232	8,133	8,289
Between MD 97 and US 29	5,522	7,089	7,035	6,639	7,598	6,994	6,766	7,117
Between US 29 and MD 193	5,588	6,784	6,819	6,362	7,024	6,354	6,133	6,400
Between MD 193 and MD 650	5,854	7,209	7,353	6,645	7,040	6,119	5,810	6,220
Between MD 650 and I-95	7,178	8,114	7,782	7,073	8,185	6,477	6,396	6,699
Between US 1 and I-95	7,037	6,692	6,992	7,371	7,444	7,688	7,317	7,000
Between Greenbelt Station and US 1	7,821	8,024	8,113	8,588	7,745	7,964	7,420	6,903
Between Greenbelt Station and MD 201	7,516	7,507	7,796	8,371	7,683	7,882	7,274	6,834
Between MD 201 and MD 295	6,962	6,849	7,593	7,954	8,325	8,647	8,018	7,463
Between MD 295 and MD 450	6,204	6,197	7,030	7,111	8,415	8,657	8,132	7,588
Between MD 450 and US 50	6,597	6,660	7,340	7,500	8,355	8,598	8,272	7,956
Between US 50 and MD 202	7,463	7,618	8,184	8,181	7,864	7,757	7,566	7,388
Between MD 202 and Arena Dr	7,391	7,318	7,812	7,781	7,710	8,042	7,513	7,233
Between Arena Dr and MD 214	7,398	7,347	7,641	7,660	7,804	8,310	7,713	7,301
Between MD 214 and Ritchie Marlboro Rd	7,322	7,285	7,160	7,435	7,471	8,346	7,610	6,937
Between Ritchie Marlboro Rd and MD 4	7,511	7,354	7,040	7,618	6,564	7,297	6,988	6,484
Between MD 4 and Forestville Rd	6,980	6,445	6,886	6,869	5,796	6,694	6,067	5,797
Between Forestville Rd and MD 218	6,336	5,838	6,238	6,281	5,115	5,666	5,060	5,102
Between MD 218 and MD 5	6,469	6,040	6,471	6,482	5,741	6,337	5,657	5,424
Between MD 5 and MD 414	6,833	5,315	5,820	5,890	4,370	4,929	4,544	4,438
Between MD 414 and MD 210	6,839	5,420	5,966	5,630	4,617	4,984	4,823	4,544
Between MD 210 and I-295	7,810	6,659	6,952	6,254	4,416	4,877	4,576	4,339
Woodrow Wilson Bridge	9,516	9,954	9,854	7,756	7,484	8,251	7,896	7,056

I-270 Existing AM Throughputs	Southbound				Northbound			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
Between MD 85 and MD 80	3,276	3,312	3,095	2,869	1,704	2,445	2,525	2,518
Between MD 80 and MD 109	3,551	3,545	3,562	3,349	1,558	2,118	2,234	2,271
Between MD 109 and MD 121	3,982	3,975	3,960	3,853	1,622	2,172	2,273	2,358
Between MD 121 and MD 27	5,063	4,804	4,588	4,539	1,910	2,403	2,419	2,665
Between MD 27 and MD 118	5,542	4,946	5,111	4,894	2,125	2,689	2,782	3,186
Between MD 118 and Middlebrook Rd	6,032	5,470	5,856	5,284	2,351	2,984	3,341	3,989
Between Middlebrook Rd and Watkins Mill	7,842	7,182	7,313	6,909	2,832	3,643	4,165	4,908
Between Watkins Mill and MD 124	7,704	7,138	7,083	7,481	2,845	3,638	4,211	4,947
Between MD 124 and MD 117	8,281	7,461	7,432	7,999	2,884	3,960	4,757	5,310
Between MD 117 and I-370	10,030	9,279	9,028	9,786	3,071	4,280	5,234	5,816
Between I-370 and Shady Grove Rd	10,749	9,188	8,509	9,997	2,829	3,815	4,985	5,202
Between Shady Grove Rd and MD 28	10,384	8,859	8,069	9,119	3,519	4,562	6,144	6,237
Between MD 28 and MD 189	10,523	9,672	8,527	9,759	5,404	6,481	8,581	8,607
Between MD 189 and Montrose Rd	10,174	9,649	9,004	9,789	4,216	5,517	7,728	7,472
Between Montrose Rd and I-270 Split	9,593	10,064	9,809	9,608	4,977	6,161	8,427	8,038
Between I-270 Split and MD 187	3,567	4,722	4,707	4,381	1,956	2,583	4,012	3,614
Between MD 187 and I-495	2,957	3,925	3,667	3,586	2,525	3,455	4,631	4,075
Between I-270 Split and Democracy Blvd	5,849	5,428	5,277	5,037	2,984	3,561	4,419	4,309
Between Democracy Blvd and I-495	5,694	5,403	5,329	4,712	3,059	3,494	4,345	4,241

Throughput and Percent Demand Met
Existing

I-495 Existing AM Percent Demand Met	Inner Loop				Outer Loop			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
Between VA 193 and GW Memorial Pkwy	98%	98%	96%	98%	100%	97%	99%	100%
American Legion Bridge	99%	87%	89%	93%	100%	97%	100%	100%
Between Clara Barton Pkwy and Cabin John Pkwy	100%	88%	90%	93%	100%	97%	100%	100%
Between MD 190 and I-270	100%	87%	89%	92%	100%	97%	100%	100%
Between I-270 West and MD 187	100%	98%	93%	93%	100%	100%	96%	100%
Between I-270 East and MD 187	100%	100%	94%	93%	100%	100%	97%	100%
Between MD 355 and MD 185	99%	94%	95%	100%	100%	100%	99%	100%
Between MD 185 and MD 97	100%	94%	97%	100%	100%	100%	100%	100%
Between MD 97 and US 29	100%	95%	97%	99%	85%	82%	98%	97%
Between MD US 29 and MD 193	100%	96%	98%	100%	87%	87%	100%	100%
Between MD 193 and MD 650	100%	96%	98%	100%	90%	89%	100%	100%
Between MD 650 and I-95	100%	96%	98%	100%	97%	87%	100%	100%
Between US 1 and I-95	100%	88%	97%	100%	98%	98%	100%	100%
Between Greenbelt Station and US1	100%	92%	96%	100%	98%	95%	100%	100%
Between Greenbelt Station and MD 201	100%	91%	96%	100%	98%	95%	100%	100%
Between MD 201 and MD 295	100%	90%	97%	100%	99%	94%	100%	100%
Between MD 295 and MD 450	100%	91%	97%	100%	100%	95%	100%	100%
Between MD 450 and US 50	100%	93%	93%	100%	97%	92%	97%	100%
Between US 50 and MD 202	100%	96%	95%	100%	98%	88%	97%	100%
Between MD 202 and Arena Dr	100%	96%	95%	100%	99%	94%	99%	100%
Between Arena Dr and MD 214	100%	96%	95%	100%	99%	96%	99%	100%
Between MD 214 and Ritchie Marlboro Rd	100%	97%	95%	100%	99%	96%	98%	100%
Between Ritchie Marlboro Rd and MD 4	100%	97%	93%	100%	99%	94%	100%	98%
Between MD 4 and Forestville Rd	100%	96%	94%	100%	99%	95%	97%	100%
Between Forestville Rd and MD 218	100%	96%	94%	100%	98%	94%	97%	99%
Between MD 218 and MD 5	100%	96%	94%	100%	97%	94%	96%	98%
Between MD 5 and MD 414	100%	97%	96%	100%	94%	89%	93%	98%
Between MD 414 and MD 210	96%	97%	99%	100%	100%	94%	100%	100%
Between MD 210 and I-295	94%	100%	100%	100%	100%	94%	99%	100%
Woodrow Wilson Bridge	94%	100%	100%	100%	100%	96%	100%	100%

I-270 Existing AM Percent Demand Met	Southbound				Northbound			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
Between MD 85 and MD 80	100%	100%	100%	99%	100%	96%	95%	100%
Between MD 80 and MD 109	100%	95%	100%	100%	100%	98%	96%	100%
Between MD 109 and MD 121	100%	94%	100%	100%	100%	98%	96%	100%
Between MD 121 and MD 27	100%	96%	100%	100%	100%	100%	97%	100%
Between MD 27 and MD 118	94%	98%	100%	100%	100%	100%	100%	100%
Between MD 118 and Middlebrook Rd	94%	98%	100%	100%	100%	100%	97%	100%
Between Middlebrook Rd and Watkins Mill	95%	97%	100%	100%	100%	99%	97%	100%
Between Watkins Mill and MD 124	94%	97%	100%	100%	100%	99%	98%	100%
Between MD 124 and MD 117	90%	94%	100%	100%	100%	100%	100%	100%
Between MD 117 and I-370	93%	95%	100%	100%	100%	93%	89%	100%
Between I-370 and Shady Grove Rd	100%	95%	96%	100%	100%	98%	98%	100%
Between Shady Grove Rd and MD 28	100%	96%	97%	100%	100%	96%	95%	100%
Between MD 28 and MD 189	100%	96%	94%	100%	100%	100%	100%	100%
Between MD 189 and Montrose Rd	99%	94%	97%	100%	100%	98%	98%	100%
Between Montrose Rd and I-270 Split	100%	93%	98%	100%	100%	100%	100%	100%
Between I-270 Split and MD 187	94%	92%	99%	100%	100%	99%	100%	100%
Between MD 187 and I-495	89%	88%	92%	100%	100%	100%	100%	100%
Between I-270 Split and Democracy Blvd	100%	96%	100%	100%	100%	100%	100%	100%
Between Democracy Blvd and I-495	100%	97%	100%	100%	100%	86%	89%	95%

🟥 <90%	🟨 >90%	🟩 100%

Throughput and Percent Demand Met
Existing

I-495 Existing PM Throughputs	Inner Loop				Outer Loop			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Between VA 193 and George Washington Pwky	7,056	6,347	5,744	6,888	5,585	5,673	5,373	5,259
American Legion Bridge	8,258	8,009	7,257	8,766	8,108	8,290	7,704	7,737
Between Clara Barton Pkwy and Cabin John Pkwy	7,541	7,005	6,360	7,594	7,125	7,014	6,372	6,634
Between MD 190 and I-270	9,007	8,642	7,969	8,679	7,750	7,466	6,791	6,656
Between I-270 West and MD 187	4,055	3,891	3,435	3,763	4,529	4,083	3,946	3,634
Between I-270 East and MD 187	3,837	3,540	3,229	3,829	4,294	3,944	3,783	3,472
Between MD 355 and MD 185	7,463	6,702	7,255	6,909	7,914	7,616	7,724	7,491
Between MD 185 and MD 97	7,517	7,214	7,203	6,681	7,643	7,639	7,715	7,517
Between MD 97 and US 29	7,925	7,520	7,320	6,562	7,155	7,453	7,613	7,239
Between US 29 and MD 193	7,691	7,165	7,303	6,198	6,460	6,741	6,812	6,414
Between MD 193 and MD 650	7,550	7,647	7,488	6,631	6,700	6,984	7,428	6,831
Between MD 650 and I-95	8,146	8,282	8,026	7,305	6,944	7,279	7,865	7,322
Between US 1 and I-95	6,782	6,660	6,705	5,724	8,197	8,456	8,434	8,217
Between Greenbelt Station and US 1	8,169	8,088	7,993	7,337	7,519	7,779	7,518	7,552
Between Greenbelt Station and MD 201	8,092	7,957	7,532	7,527	7,375	7,388	6,996	7,035
Between MD 201 and MD 295	7,878	7,950	7,292	7,449	7,452	6,976	6,641	6,892
Between MD 295 and MD 450	7,921	7,777	6,878	6,850	6,625	6,641	6,100	5,944
Between MD 450 and US 50	8,394	8,151	7,516	7,933	7,039	7,184	6,758	6,362
Between US 50 and MD 202	7,972	7,981	8,014	8,252	7,053	7,282	6,991	6,875
Between MD 202 and Arena Dr	7,578	7,647	7,936	7,852	6,970	7,256	6,910	7,127
Between Arena Dr and MD 214	7,514	7,596	7,839	7,456	7,176	7,022	6,979	7,121
Between MD 214 and Ritchie Marlboro Rd	7,159	7,589	7,821	7,361	7,901	7,272	7,379	7,375
Between Ritchie Marlboro Rd and MD 4	6,441	7,021	7,484	7,375	7,571	7,645	7,600	6,877
Between MD 4 and Forestville Rd	6,027	6,818	7,205	7,232	7,263	7,271	7,337	6,622
Between Forestville Rd and MD 218	5,607	6,327	6,770	6,681	6,406	6,217	6,230	5,522
Between MD 218 and MD 5	6,025	6,941	7,326	7,092	6,679	6,668	6,478	5,709
Between MD 5 and MD 414	4,843	5,722	6,079	5,727	6,597	6,448	6,399	5,725
Between MD 414 and MD 210	4,607	5,469	5,806	5,222	7,134	7,271	7,323	6,408
Between MD 210 and I-295	4,822	5,750	5,797	5,467	7,362	7,499	7,531	6,730
Woodrow Wilson Bridge	7,548	8,608	8,822	8,302	9,116	9,137	9,213	8,579

I-270 Existing PM Throughputs	Southbound				Northbound			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Between MD 85 and MD 80	2,023	2,322	2,714	2,535	4,040	4,173	4,137	3,916
Between MD 80 and MD 109	1,801	2,131	2,489	2,342	4,024	4,099	4,284	4,044
Between MD 109 and MD 121	1,906	2,201	2,554	2,386	3,994	4,180	4,327	4,176
Between MD 121 and MD 27	2,268	2,575	3,028	2,883	4,438	4,909	4,940	4,612
Between MD 27 and MD 118	2,765	2,975	3,217	3,327	6,032	6,194	6,225	6,082
Between MD 118 and Middlebrook Rd	3,215	3,534	3,886	3,805	6,723	6,658	6,749	6,734
Between Middlebrook Rd and Watkins Mill	4,135	4,427	5,015	4,827	8,201	7,849	8,006	8,123
Between Watkins Mill and MD 124	4,166	4,431	5,006	4,853	8,241	7,936	8,023	8,133
Between MD 124 and MD 117	4,459	4,829	5,289	5,137	8,897	8,783	8,574	8,871
Between MD 117 and I-370	5,784	6,460	6,982	6,475	10,177	10,335	9,885	10,197
Between I-370 and Shady Grove Rd	5,608	5,888	6,197	6,214	10,680	10,543	10,043	10,171
Between Shady Grove Rd and MD 28	6,465	6,930	7,479	7,068	10,878	10,961	10,535	10,023
Between MD 28 and MD 189	7,235	7,620	8,289	7,879	11,378	11,537	11,427	10,909
Between MD 189 and Montrose Rd	6,945	7,375	7,898	7,581	11,154	11,290	11,453	11,027
Between Montrose Rd and I-270 Split	6,687	7,359	7,504	7,309	10,983	11,016	11,208	10,835
Between I-270 Split and MD 187	3,386	3,635	3,570	3,750	4,937	5,117	5,193	4,848
Between MD 187 and I-495	3,459	3,654	3,543	3,482	4,398	4,320	4,295	4,571
Between I-270 Split and Democracy Blvd	3,283	3,632	3,931	3,544	5,506	5,332	5,223	5,376
Between Democracy Blvd and I-495	3,333	3,415	3,273	3,114	5,111	4,838	4,731	5,039

Throughput and Percent Demand Met
Existing

I-495 Existing PM Percent Demand Met	Inner Loop				Outer Loop			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Between VA 193 and GW Memorial Pkwy	100%	94%	83%	100%	97%	93%	95%	96%
PMerican Legion Bridge	97%	95%	84%	100%	98%	96%	92%	98%
Between Clara Barton Pkwy and Cabin John Pkwy	97%	95%	87%	100%	98%	96%	89%	97%
Between MD 190 and I-270	100%	97%	94%	100%	100%	96%	89%	96%
Between I-270 West and MD 187	100%	100%	96%	100%	100%	98%	95%	97%
Between I-270 East and MD 187	100%	97%	94%	100%	100%	99%	94%	100%
Between MD 355 and MD 185	100%	90%	100%	100%	99%	97%	97%	100%
Between MD 185 and MD 97	91%	86%	92%	100%	98%	97%	97%	100%
Between MD 97 and US 29	92%	87%	92%	98%	96%	96%	95%	100%
Between MD US 29 and MD 193	94%	85%	95%	97%	95%	94%	94%	100%
Between MD 193 and MD 650	92%	90%	94%	98%	96%	94%	96%	100%
Between MD 650 and I-95	93%	91%	94%	98%	94%	92%	96%	100%
Between US 1 and I-95	100%	93%	99%	100%	94%	91%	95%	100%
Between Greenbelt Station and US1	100%	100%	100%	100%	92%	90%	94%	100%
Between Greenbelt Station and MD 201	100%	100%	99%	100%	92%	89%	94%	100%
Between MD 201 and MD 295	100%	99%	96%	100%	92%	80%	84%	100%
Between MD 295 and MD 450	100%	94%	88%	100%	91%	89%	89%	100%
Between MD 450 and US 50	100%	92%	89%	100%	90%	90%	91%	100%
Between US 50 and MD 202	93%	89%	89%	100%	90%	90%	93%	100%
Between MD 202 and Arena Dr	93%	89%	92%	100%	89%	90%	91%	100%
Between Arena Dr and MD 214	92%	91%	94%	100%	93%	88%	92%	100%
Between MD 214 and Ritchie Marlboro Rd	92%	91%	95%	100%	100%	89%	94%	100%
Between Ritchie Marlboro Rd and MD 4	100%	100%	100%	100%	98%	94%	97%	100%
Between MD 4 and Forestville Rd	100%	100%	100%	100%	98%	97%	99%	100%
Between Forestville Rd and MD 218	100%	100%	100%	100%	100%	98%	99%	100%
Between MD 218 and MD 5	100%	100%	100%	100%	99%	99%	97%	99%
Between MD 5 and MD 414	100%	100%	100%	100%	97%	96%	96%	98%
Between MD 414 and MD 210	100%	100%	100%	100%	99%	99%	100%	100%
Between MD 210 and I-295	100%	100%	100%	100%	100%	99%	99%	100%
Woodrow Wilson Bridge	100%	100%	100%	100%	100%	99%	99%	100%

I-270 Existing PM Percent Demand Met	Southbound				Northbound			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Between MD 85 and MD 80	100%	98%	99%	99%	100%	90%	93%	100%
Between MD 80 and MD 109	98%	96%	98%	99%	100%	90%	94%	100%
Between MD 109 and MD 121	99%	95%	96%	99%	100%	90%	93%	100%
Between MD 121 and MD 27	98%	95%	97%	100%	100%	94%	94%	100%
Between MD 27 and MD 118	99%	95%	97%	100%	100%	100%	100%	100%
Between MD 118 and Middlebrook Rd	98%	96%	100%	100%	100%	96%	96%	100%
Between Middlebrook Rd and Watkins Mill	99%	96%	100%	100%	100%	95%	96%	100%
Between Watkins Mill and MD 124	99%	96%	100%	100%	100%	96%	96%	100%
Between MD 124 and MD 117	99%	98%	99%	100%	100%	96%	93%	100%
Between MD 117 and I-370	100%	98%	99%	100%	100%	96%	93%	100%
Between I-370 and Shady Grove Rd	100%	100%	98%	100%	100%	96%	96%	100%
Between Shady Grove Rd and MD 28	100%	100%	100%	100%	100%	100%	100%	100%
Between MD 28 and MD 189	100%	100%	100%	100%	100%	100%	100%	100%
Between MD 189 and Montrose Rd	100%	100%	100%	100%	100%	98%	100%	100%
Between Montrose Rd and I-270 Split	100%	100%	100%	100%	100%	96%	98%	100%
Between I-270 Split and MD 187	100%	100%	100%	100%	100%	100%	100%	98%
Between MD 187 and I-495	99%	100%	98%	100%	100%	100%	99%	100%
Between I-270 Split and Democracy Blvd	96%	94%	97%	100%	94%	85%	83%	94%
Between Democracy Blvd and I-495	100%	95%	95%	98%	100%	94%	96%	100%

<90%	>90%	100%

Throughput and Percent Demand Met
2025

I-495 2025 No-Build AM Throughputs	Inner Loop				Outer Loop			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
Between VA 193 and GW Memorial Pkwy	7,801	8,399	7,497	7,401	6,242	6,505	7,003	6,316
American Legion Bridge	8,391	8,455	8,518	8,573	8,487	8,773	9,338	8,377
Between Clara Barton Pkwy and Cabin John Pkwy	7,832	7,918	7,873	7,850	8,307	8,189	8,217	7,381
Between MD 190 and I-270	7,530	7,978	8,303	8,288	10,231	10,065	9,898	8,789
Between I-270 West and MD 187	4,550	4,516	3,892	3,920	3,936	4,510	4,124	4,304
Between I-270 East and MD 187	4,224	4,248	3,712	3,765	3,757	4,440	3,711	4,111
Between MD 355 and MD 185	6,517	7,923	7,227	6,915	6,663	7,828	8,238	7,987
Between MD 185 and MD 97	6,111	7,504	7,392	6,866	7,930	8,216	8,187	8,204
Between MD 97 and US 29	5,672	7,260	7,046	6,677	7,515	6,866	6,930	6,834
Between US 29 and MD 193	5,654	6,917	6,822	6,401	6,916	6,290	6,224	6,213
Between MD 193 and MD 650	5,961	7,357	7,354	6,732	6,905	5,943	5,968	5,991
Between MD 650 and I-95	7,299	8,260	7,824	7,171	7,988	6,282	6,572	6,655
Between US 1 and I-95	7,204	6,289	7,147	7,268	7,508	7,594	7,384	7,007
Between Greenbelt Station and US 1	8,141	7,655	8,333	8,325	7,738	7,839	7,470	6,829
Between Greenbelt Station and MD 201	7,714	7,332	8,005	7,941	7,818	7,903	7,525	6,870
Between MD 201 and MD 295	7,072	6,640	7,706	7,526	8,430	8,673	8,304	7,506
Between MD 295 and MD 450	6,325	6,064	7,085	6,837	8,520	8,654	8,487	7,731
Between MD 450 and US 50	6,707	6,578	7,446	7,274	8,551	8,628	8,534	8,076
Between US 50 and MD 202	7,612	7,627	8,331	8,091	8,058	7,911	7,732	7,400
Between MD 202 and Arena Dr	7,530	7,345	7,951	7,809	7,864	8,171	7,653	7,363
Between Arena Dr and MD 214	7,513	7,404	7,760	7,703	7,930	8,453	7,842	7,442
Between MD 214 and Ritchie Marlboro Rd	7,459	7,330	7,332	7,514	7,647	8,466	7,717	7,137
Between Ritchie Marlboro Rd and MD 4	7,606	7,502	7,073	7,705	6,681	7,455	7,110	6,673
Between MD 4 and Forestville Rd	7,136	6,504	7,007	6,950	5,943	6,808	6,192	5,923
Between Forestville Rd and MD 218	6,437	5,923	6,325	6,356	5,230	5,691	5,101	5,228
Between MD 218 and MD 5	6,606	6,132	6,547	6,533	5,893	6,439	5,686	5,618
Between MD 5 and MD 414	6,954	5,478	5,923	5,953	4,469	5,037	4,489	4,643
Between MD 414 and MD 210	6,720	5,059	6,249	6,477	4,705	5,087	4,748	4,835
Between MD 210 and I-295	7,790	6,354	7,144	7,159	4,546	4,940	4,465	4,639
Woodrow Wilson Bridge	9,687	9,994	9,858	8,893	7,755	8,367	7,733	7,860

I-270 2025 No-Build AM Throughputs	Southbound				Northbound			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
Between MD 85 and MD 80	3,410	3,447	3,226	2,976	1,787	2,597	2,568	2,418
Between MD 80 and MD 109	3,733	3,670	3,739	3,464	1,659	2,193	2,222	2,052
Between MD 109 and MD 121	4,101	4,075	4,122	3,879	1,742	2,258	2,237	2,069
Between MD 121 and MD 27	5,187	5,142	4,852	4,759	2,151	2,465	2,323	2,340
Between MD 27 and MD 118	5,695	5,564	5,200	5,166	2,451	2,915	2,815	2,999
Between MD 118 and Middlebrook Rd	6,157	6,129	5,993	5,519	2,768	3,407	3,705	4,051
Between Middlebrook Rd and Watkins Mill	8,032	7,983	7,698	6,999	3,362	4,227	4,795	5,160
Between Watkins Mill and MD 124	6,814	6,563	6,270	5,570	2,780	3,694	4,307	4,663
Between MD 124 and MD 117	8,107	8,094	7,731	6,922	2,916	4,327	5,223	5,360
Between MD 117 and I-370	9,827	9,963	9,666	8,508	3,119	4,687	5,717	5,854
Between I-370 and Shady Grove Rd	10,470	9,949	9,353	8,576	2,831	3,833	5,025	5,144
Between Shady Grove Rd and MD 28	10,352	9,551	8,704	8,035	3,610	4,828	6,528	6,539
Between MD 28 and MD 189	10,818	10,530	9,388	8,724	5,413	6,718	9,118	9,040
Between MD 189 and Montrose Rd	10,706	10,482	9,563	8,798	4,362	5,738	8,112	7,873
Between Montrose Rd and I-270 Split	10,461	10,884	9,937	8,838	5,063	6,381	8,794	8,479
Between I-270 Split and MD 187	4,003	5,021	4,663	3,986	1,957	2,594	4,081	3,693
Between MD 187 and I-495	3,243	4,125	3,648	3,277	2,523	3,488	4,702	4,105
Between I-270 Split and Democracy Blvd	6,475	5,779	5,357	4,754	3,058	3,708	4,600	4,561
Between Democracy Blvd and I-495	6,267	5,786	5,338	4,458	3,148	3,618	4,534	4,512

Throughput and Percent Demand Met
2025

I-495 2025 No-Build AM Percent Demand Met	Inner Loop				Outer Loop			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
Between VA 193 and GW Memorial Pkwy	98%	99%	95%	99%	100%	97%	100%	100%
American Legion Bridge	100%	89%	93%	100%	100%	96%	100%	100%
Between Clara Barton Pkwy and Cabin John Pkwy	100%	87%	90%	94%	100%	93%	100%	96%
Between MD 190 and I-270	99%	87%	89%	93%	100%	96%	100%	99%
Between I-270 West and MD 187	100%	99%	93%	93%	100%	96%	99%	100%
Between I-270 East and MD 187	100%	100%	95%	93%	100%	100%	95%	99%
Between MD 355 and MD 185	100%	95%	95%	96%	100%	99%	98%	99%
Between MD 185 and MD 97	100%	95%	96%	97%	100%	98%	98%	98%
Between MD 97 and US 29	100%	96%	96%	97%	82%	79%	97%	91%
Between MD US 29 and MD 193	100%	97%	97%	98%	84%	85%	100%	98%
Between MD 193 and MD 650	100%	97%	97%	99%	86%	85%	100%	97%
Between MD 650 and I-95	100%	96%	97%	100%	93%	84%	100%	98%
Between US 1 and I-95	100%	81%	97%	100%	97%	95%	100%	100%
Between Greenbelt Station and US1	100%	86%	96%	100%	95%	92%	100%	100%
Between Greenbelt Station and MD 201	100%	86%	96%	100%	95%	91%	100%	100%
Between MD 201 and MD 295	100%	86%	96%	100%	99%	93%	100%	100%
Between MD 295 and MD 450	100%	87%	96%	100%	99%	94%	100%	100%
Between MD 450 and US 50	100%	90%	93%	100%	98%	91%	98%	100%
Between US 50 and MD 202	100%	94%	95%	100%	98%	88%	97%	98%
Between MD 202 and Arena Dr	100%	94%	95%	100%	99%	93%	98%	100%
Between Arena Dr and MD 214	100%	94%	94%	100%	99%	95%	98%	100%
Between MD 214 and Ritchie Marlboro Rd	100%	95%	95%	100%	99%	95%	97%	100%
Between Ritchie Marlboro Rd and MD 4	100%	96%	91%	100%	98%	94%	99%	99%
Between MD 4 and Forestville Rd	100%	94%	94%	100%	99%	94%	97%	99%
Between Forestville Rd and MD 218	100%	95%	93%	100%	98%	93%	96%	100%
Between MD 218 and MD 5	100%	95%	93%	100%	97%	93%	94%	99%
Between MD 5 and MD 414	100%	97%	95%	100%	93%	89%	89%	100%
Between MD 414 and MD 210	92%	88%	100%	100%	100%	93%	96%	100%
Between MD 210 and I-295	92%	94%	100%	100%	100%	92%	94%	100%
Woodrow Wilson Bridge	92%	98%	100%	100%	100%	94%	95%	100%

I-270 2025 No-Build AM Percent Demand Met	Southbound				Northbound			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
Between MD 85 and MD 80	100%	100%	100%	98%	100%	97%	92%	100%
Between MD 80 and MD 109	100%	94%	100%	100%	100%	97%	92%	97%
Between MD 109 and MD 121	100%	92%	100%	100%	100%	97%	91%	96%
Between MD 121 and MD 27	100%	98%	100%	100%	100%	98%	88%	97%
Between MD 27 and MD 118	93%	100%	100%	100%	100%	100%	100%	100%
Between MD 118 and Middlebrook Rd	92%	100%	100%	100%	100%	100%	100%	100%
Between Middlebrook Rd and Watkins Mill	94%	100%	100%	100%	100%	100%	100%	100%
Between Watkins Mill and MD 124	88%	98%	100%	100%	100%	98%	97%	100%
Between MD 124 and MD 117	86%	99%	100%	100%	100%	100%	100%	100%
Between MD 117 and I-370	89%	99%	100%	100%	100%	98%	92%	100%
Between I-370 and Shady Grove Rd	100%	99%	100%	99%	100%	93%	93%	99%
Between Shady Grove Rd and MD 28	100%	100%	100%	99%	100%	96%	96%	100%
Between MD 28 and MD 189	100%	100%	100%	97%	100%	100%	100%	100%
Between MD 189 and Montrose Rd	100%	98%	99%	96%	100%	98%	98%	100%
Between Montrose Rd and I-270 Split	100%	97%	96%	94%	100%	100%	100%	100%
Between I-270 Split and MD 187	100%	94%	95%	94%	100%	97%	100%	100%
Between MD 187 and I-495	95%	89%	89%	88%	100%	100%	100%	100%
Between I-270 Split and Democracy Blvd	100%	98%	98%	92%	100%	100%	100%	100%
Between Democracy Blvd and I-495	100%	100%	100%	98%	100%	85%	89%	97%

<90%	>90%	100%

Throughput and Percent Demand Met
2025

I-495 2025 No-Build PM Throughputs	Inner Loop				Outer Loop			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Between VA 193 and GW Memorial Pkwy	7,007	6,268	6,961	6,275	5,790	6,046	5,514	5,580
American Legion Bridge	7,968	7,923	8,502	8,157	8,196	8,482	8,060	8,079
Between Clara Barton Pkwy and Cabin John Pkwy	7,171	7,026	7,126	7,032	7,147	7,017	6,746	6,926
Between MD 190 and I-270	8,992	9,040	8,327	8,688	7,677	7,431	7,106	6,937
Between I-270 West and MD 187	4,053	4,052	3,368	3,893	4,658	4,058	3,740	3,793
Between I-270 East and MD 187	3,826	3,427	3,194	4,068	4,434	4,095	3,646	3,421
Between MD 355 and MD 185	7,390	6,693	6,998	6,909	8,015	7,818	7,427	7,442
Between MD 185 and MD 97	7,563	7,053	7,044	6,964	7,795	7,640	7,321	7,410
Between MD 97 and US 29	7,931	7,271	7,387	6,894	7,314	7,341	7,039	7,107
Between US 29 and MD 193	7,617	7,232	7,111	6,605	6,502	6,589	6,128	6,266
Between MD 193 and MD 650	7,613	7,664	7,456	7,096	6,772	6,770	6,496	6,769
Between MD 650 and I-95	8,359	8,247	8,046	7,662	7,022	6,963	6,694	7,294
Between US 1 and I-95	6,509	6,026	5,477	5,732	8,161	8,343	8,694	8,293
Between Greenbelt Station and US 1	7,977	7,300	6,941	7,147	7,444	7,624	7,767	7,590
Between Greenbelt Station and MD 201	7,963	7,051	6,888	7,372	7,147	7,160	7,287	7,346
Between MD 201 and MD 295	7,746	6,905	6,918	7,541	7,189	6,623	6,858	7,069
Between MD 295 and MD 450	7,776	6,849	6,790	7,207	6,725	6,089	5,834	6,675
Between MD 450 and US 50	7,959	7,625	7,770	7,826	7,221	6,879	6,232	7,357
Between US 50 and MD 202	7,806	7,752	8,186	7,748	7,194	7,309	6,449	6,821
Between MD 202 and Arena Dr	7,478	7,547	7,927	7,548	6,999	7,304	6,758	6,798
Between Arena Dr and MD 214	7,495	7,540	7,636	7,406	7,110	7,232	6,703	6,796
Between MD 214 and Ritchie Marlboro Rd	7,190	7,529	7,586	7,421	7,869	7,166	6,954	6,987
Between Ritchie Marlboro Rd and MD 4	6,431	6,855	7,399	7,080	7,706	7,897	7,810	7,256
Between MD 4 and Forestville Rd	6,058	6,655	7,191	7,008	7,326	7,367	7,265	6,940
Between Forestville Rd and MD 218	5,619	6,181	6,762	6,477	6,391	6,256	6,118	5,841
Between MD 218 and MD 5	6,065	6,802	7,320	6,906	6,807	6,609	6,493	5,970
Between MD 5 and MD 414	4,819	5,659	6,097	5,656	6,726	6,352	6,426	5,836
Between MD 414 and MD 210	4,599	5,463	5,811	5,242	7,265	7,165	7,330	6,519
Between MD 210 and I-295	4,770	5,700	5,849	5,515	7,390	7,389	7,477	6,822
Woodrow Wilson Bridge	7,678	8,657	8,914	8,681	9,361	9,125	9,228	8,901

I-270 2025 No-Build PM Throughputs	Southbound				Northbound			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Between MD 85 and MD 80	2,097	2,428	2,756	2,671	4,334	4,358	4,166	3,946
Between MD 80 and MD 109	1,884	2,222	2,526	2,469	4,218	4,216	4,193	4,021
Between MD 109 and MD 121	1,991	2,276	2,645	2,494	4,254	4,250	4,227	4,227
Between MD 121 and MD 27	2,441	2,676	3,130	2,894	5,244	4,641	4,863	4,917
Between MD 27 and MD 118	2,957	3,114	3,344	3,410	6,552	5,495	5,685	6,120
Between MD 118 and Middlebrook Rd	3,416	3,689	4,020	3,945	7,282	5,935	5,958	6,516
Between Middlebrook Rd and Watkins Mill	4,378	4,647	5,186	4,974	8,584	7,175	6,956	7,778
Between Watkins Mill and MD 124	3,191	3,481	4,041	3,919	7,462	6,877	6,095	6,620
Between MD 124 and MD 117	4,635	4,839	5,431	5,151	9,090	9,441	7,318	7,484
Between MD 117 and I-370	5,985	6,529	7,218	6,523	10,470	11,188	8,098	8,374
Between I-370 and Shady Grove Rd	5,835	5,946	6,239	5,862	10,726	11,353	9,010	7,589
Between Shady Grove Rd and MD 28	6,436	6,707	6,983	6,159	10,922	11,433	10,601	7,065
Between MD 28 and MD 189	7,254	7,549	7,987	7,167	11,389	11,974	11,591	7,731
Between MD 189 and Montrose Rd	6,933	7,222	7,585	6,945	11,345	11,883	11,642	7,765
Between Montrose Rd and I-270 Split	6,714	7,274	7,294	6,595	11,073	11,620	11,383	8,431
Between I-270 Split and MD 187	3,323	3,606	3,420	3,322	4,919	5,302	5,027	3,999
Between MD 187 and I-495	3,448	3,595	3,287	3,126	4,375	4,501	4,231	4,148
Between I-270 Split and Democracy Blvd	3,344	3,626	3,846	3,240	5,555	5,705	5,530	4,721
Between Democracy Blvd and I-495	3,380	3,425	3,390	3,039	5,095	5,157	4,853	4,918

Throughput and Percent Demand Met
2025

I-495 2025 No-Build PM Percent Demand Met	Inner Loop				Outer Loop			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Between VA 193 and GW Memorial Pkwy	98%	90%	96%	100%	96%	96%	94%	96%
PMerican Legion Bridge	89%	90%	95%	100%	95%	95%	92%	97%
Between Clara Barton Pkwy and Cabin John Pkwy	89%	93%	95%	100%	95%	93%	91%	97%
Between MD 190 and I-270	100%	99%	95%	100%	98%	93%	91%	96%
Between I-270 West and MD 187	100%	100%	93%	100%	100%	95%	89%	98%
Between I-270 East and MD 187	100%	92%	91%	100%	100%	100%	90%	98%
Between MD 355 and MD 185	98%	88%	97%	100%	98%	98%	91%	99%
Between MD 185 and MD 97	88%	83%	89%	100%	98%	95%	90%	100%
Between MD 97 and US 29	89%	82%	91%	100%	96%	93%	87%	100%
Between MD US 29 and MD 193	90%	85%	91%	100%	94%	91%	84%	100%
Between MD 193 and MD 650	89%	88%	92%	100%	95%	89%	83%	100%
Between MD 650 and I-95	91%	89%	94%	100%	94%	86%	81%	100%
Between US 1 and I-95	100%	84%	80%	100%	91%	88%	97%	100%
Between Greenbelt Station and US1	100%	89%	89%	100%	89%	86%	96%	100%
Between Greenbelt Station and MD 201	100%	87%	88%	100%	82%	77%	85%	100%
Between MD 201 and MD 295	100%	86%	90%	100%	87%	75%	86%	100%
Between MD 295 and MD 450	100%	83%	86%	100%	91%	80%	84%	100%
Between MD 450 and US 50	95%	85%	91%	100%	91%	84%	83%	100%
Between US 50 and MD 202	91%	86%	90%	100%	90%	88%	85%	100%
Between MD 202 and Arena Dr	91%	87%	91%	99%	88%	88%	88%	100%
Between Arena Dr and MD 214	91%	89%	91%	99%	90%	88%	87%	100%
Between MD 214 and Ritchie Marlboro Rd	93%	90%	91%	100%	99%	85%	87%	100%
Between Ritchie Marlboro Rd and MD 4	100%	99%	99%	100%	97%	95%	97%	100%
Between MD 4 and Forestville Rd	100%	99%	100%	100%	96%	96%	96%	100%
Between Forestville Rd and MD 218	100%	99%	100%	100%	97%	96%	95%	100%
Between MD 218 and MD 5	100%	99%	100%	100%	98%	95%	94%	100%
Between MD 5 and MD 414	100%	98%	100%	100%	96%	92%	93%	97%
Between MD 414 and MD 210	100%	99%	100%	100%	98%	94%	97%	99%
Between MD 210 and I-295	100%	98%	99%	100%	98%	94%	95%	99%
Woodrow Wilson Bridge	100%	100%	100%	100%	99%	96%	95%	100%

I-270 2025 No-Build PM Percent Demand Met	Southbound				Northbound			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
Between MD 85 and MD 80	100%	98%	97%	99%	100%	90%	90%	100%
Between MD 80 and MD 109	99%	96%	96%	99%	100%	88%	88%	100%
Between MD 109 and MD 121	99%	94%	96%	98%	100%	87%	87%	100%
Between MD 121 and MD 27	100%	94%	95%	96%	100%	84%	88%	100%
Between MD 27 and MD 118	100%	95%	97%	100%	100%	100%	100%	100%
Between MD 118 and Middlebrook Rd	99%	95%	98%	98%	100%	81%	81%	98%
Between Middlebrook Rd and Watkins Mill	99%	96%	99%	99%	100%	80%	79%	94%
Between Watkins Mill and MD 124	85%	83%	86%	88%	91%	78%	68%	80%
Between MD 124 and MD 117	99%	94%	96%	98%	100%	97%	74%	82%
Between MD 117 and I-370	99%	96%	98%	100%	100%	100%	74%	82%
Between I-370 and Shady Grove Rd	100%	98%	94%	95%	100%	100%	83%	73%
Between Shady Grove Rd and MD 28	100%	98%	91%	90%	100%	100%	97%	69%
Between MD 28 and MD 189	100%	99%	94%	93%	100%	100%	100%	82%
Between MD 189 and Montrose Rd	99%	98%	94%	93%	100%	99%	98%	69%
Between Montrose Rd and I-270 Split	97%	96%	93%	91%	100%	98%	96%	76%
Between I-270 Split and MD 187	98%	100%	95%	94%	100%	100%	94%	79%
Between MD 187 and I-495	96%	95%	88%	90%	100%	100%	94%	90%
Between I-270 Split and Democracy Blvd	94%	90%	90%	88%	91%	87%	85%	79%
Between Democracy Blvd and I-495	97%	92%	94%	91%	100%	97%	95%	100%

🟥 <90%	🟨 >90%	🟩 100%

I-495 Throughput	Inner Loop				Outer Loop			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
BETWEEN VA-193 AND GW MEMORIAL PKWY	7388	7608	6813	6891	7109	7834	7709	7346
AMERICAN LEGION BRIDGE	8649	9171	9092	8766	8615	9205	8709	8463
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7862	8509	8372	7902	8351	8395	7174	7346
BETWEEN MD 190 AND I-270	7533	8439	8446	7739	10140	9649	8397	8389
BETWEEN I-270 WEST AND MD 187	4279	4490	3727	3395	3883	4164	3350	3212
BETWEEN I-270 EAST AND MD 187	3994	4205	3439	3251	3531	4116	3165	2919
BETWEEN MD 355 AND MD 185	6370	7970	7407	6940	6595	7871	7836	5536
BETWEEN MD 185 AND MD 97	5978	7464	7625	6780	7995	8196	8197	4985
BETWEEN MD 97 AND US 29	5768	7271	7504	6250	7504	6979	6731	4501
BETWEEN MD US 29 AND MD 193	5846	7113	7395	6165	6744	6250	6050	4301
BETWEEN MD 193 AND MD 650	6199	7488	7716	6615	6365	5971	5883	4515
BETWEEN MD 650 AND I-95	7450	8321	8062	7019	7281	6222	6734	5465
BETWEEN US 1 AND I-95	6692	6226	6105	6614	8258	8237	8090	7451
BETWEEN GREENBELT STATION AND US 1	7548	7349	7353	7662	8563	8554	8348	7428
BETWEEN GREENBELT STATION AND MD 201	7187	7048	7109	7428	8543	8540	8332	7433
BETWEEN MD 201 AND MD 295	6554	6494	7016	7069	8246	8805	8167	7397
BETWEEN MD 295 AND MD 450	5940	5994	6743	6472	8056	8387	7919	7273
BETWEEN MD 450 AND US 50	6405	6434	7265	7005	7992	8455	8094	7653
BETWEEN US 50 AND MD 202	7563	7653	8386	6505	7243	7394	7099	7079
BETWEEN MD 202 AND ARENA DR	7574	7400	8097	6156	6922	7253	6648	6827
BETWEEN ARENA DR AND MD 214	7561	7310	7397	6280	7058	7228	6886	6750
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7393	7127	5937	6532	6462	6817	6452	6245
BETWEEN RITCHIE MARLBORO AND MD 4	7398	6824	4790	7827	6846	6107	4925	6792
BETWEEN MD 4 AND FORESTVILLE RD	7322	5661	4763	7809	6006	5684	3589	6696
BETWEEN FORESTVILLE AND MD 218	6625	4732	4585	7348	5304	4451	2603	6619
BETWEEN MD 218 AND MD 5	6671	4333	5224	7844	6129	4995	2969	7620
BETWEEN MD 5 AND MD 414	6340	3346	4927	7001	5045	5784	3291	6596
BETWEEN MD 414 AND MD 210	5511	4021	5485	6926	4835	5379	3981	5568
BETWEEN MD 210 AND I-295	6876	5639	6541	7766	4748	5485	4915	4566
WOODROW WILSON BRIDGE	9557	9135	9335	9193	7493	8604	7859	6825

I-270 Throughput	Southbound				Northbound			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
BETWEEN MD 85 AND MD 80	3078	3042	2389	2382	2347	3142	3452	3161
BETWEEN MD 80 AND MD 109	3695	3534	3152	3081	2248	2952	3129	2950
BETWEEN MD 109 AND MD 121	4098	3675	3535	3438	2304	3060	3192	3000
BETWEEN MD 121 AND MD 27	4842	4448	4216	4541	2758	3389	3413	3217
BETWEEN MD 27 AND MD 118	5090	4994	4454	5122	2929	3671	3803	3556
BETWEEN MD 118 AND MIDDLEBROOK RD	5645	5359	5106	5531	3007	3826	3944	3968
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	7239	7172	6690	6988	3480	4451	4688	4690
BETWEEN WATKINS MILL AND MD 124	5536	5277	5106	5142	2666	3482	3910	3491
BETWEEN MD 124 AND MD 117	7581	7272	7092	7180	3490	4879	5762	5270
BETWEEN MD 117 AND I-370	9321	9075	8913	8902	4010	5791	7131	6366
BETWEEN I-370 AND SHADY GROVE RD	10537	9571	8950	8876	3693	4987	6280	5768
BETWEEN SHADY GROVE RD AND MD 28	10629	9189	8405	8410	4286	5610	7195	6465
BETWEEN MD 28 AND MD 189	11258	10316	9348	9188	6189	7836	9737	8532
BETWEEN MD 189 AND MONTROSE RD	11154	10713	9928	9480	4873	6477	8485	7421
BETWEEN MONTROSE RD AND I-270 SPLIT	10998	11415	10877	9919	5253	6708	8542	7354
BETWEEN I-270 SPLIT AND MD 187	4321	5223	5270	4783	2115	3118	4253	3151
BETWEEN MD 187 AND I-495	3306	4328	4294	3968	2707	3908	4760	3356
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	6539	5920	5331	4659	3059	3511	4162	3990
BETWEEN DEMOCRACY BLVD AND I-495	6374	5829	5347	4587	3463	4096	4604	4497

I-495 Percent Vehicle Demand Met	Inner Loop				Outer Loop			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
BETWEEN VA-193 AND GW MEMORIAL PKWY	84%	81%	77%	84%	83%	82%	86%	90%
AMERICAN LEGION BRIDGE	99%	89%	90%	94%	84%	83%	87%	91%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	98%	89%	90%	93%	83%	82%	84%	91%
BETWEEN MD 190 AND I-270	97%	88%	87%	85%	84%	80%	84%	91%
BETWEEN I-270 WEST AND MD 187	99%	89%	87%	84%	83%	73%	75%	73%
BETWEEN I-270 EAST AND MD 187	98%	88%	84%	83%	80%	82%	81%	73%
BETWEEN MD 355 AND MD 185	94%	90%	92%	92%	79%	82%	87%	65%
BETWEEN MD 185 AND MD 97	95%	89%	94%	92%	78%	79%	92%	55%
BETWEEN MD 97 AND US 29	95%	88%	94%	84%	74%	75%	91%	57%
BETWEEN MD US 29 AND MD 193	96%	90%	95%	86%	74%	78%	96%	64%
BETWEEN MD 193 AND MD 650	97%	90%	94%	89%	72%	78%	96%	68%
BETWEEN MD 650 AND I-95	97%	90%	94%	91%	76%	74%	95%	74%
BETWEEN US 1 AND I-95	89%	72%	72%	83%	93%	91%	99%	97%
BETWEEN GREENBELT STATION AND US 1	90%	74%	74%	87%	92%	89%	99%	96%
BETWEEN GREENBELT STATION AND MD 201	91%	74%	75%	88%	92%	87%	97%	95%
BETWEEN MD 201 AND MD 295	92%	77%	78%	90%	89%	88%	93%	94%
BETWEEN MD 295 AND MD 450	95%	80%	83%	93%	87%	85%	90%	90%
BETWEEN MD 450 AND US 50	95%	82%	85%	94%	86%	85%	88%	90%
BETWEEN US 50 AND MD 202	98%	89%	90%	79%	83%	78%	84%	88%
BETWEEN MD 202 AND ARENA DR	99%	89%	91%	77%	81%	77%	79%	87%
BETWEEN ARENA DR AND MD 214	100%	89%	86%	80%	81%	76%	80%	86%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	100%	90%	75%	88%	79%	72%	77%	83%
BETWEEN RITCHIE MARLBORO AND MD 4	100%	87%	61%	100%	93%	72%	64%	93%
BETWEEN MD 4 AND FORESTVILLE RD	97%	76%	60%	100%	100%	79%	56%	100%
BETWEEN FORESTVILLE AND MD 218	97%	69%	63%	100%	99%	72%	48%	100%
BETWEEN MD 218 AND MD 5	94%	61%	69%	100%	98%	71%	48%	100%
BETWEEN MD 5 AND MD 414	83%	54%	72%	100%	99%	96%	61%	100%
BETWEEN MD 414 AND MD 210	69%	64%	82%	100%	100%	98%	80%	100%
BETWEEN MD 210 AND I-295	72%	75%	87%	100%	100%	99%	99%	100%
WOODROW WILSON BRIDGE	83%	84%	89%	100%	100%	99%	100%	99%

<90%	>90%	100%

I-270 Percent Vehicle Demand Met	Southbound				Northbound			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
BETWEEN MD 85 AND MD 80	74%	71%	56%	65%	94%	85%	91%	97%
BETWEEN MD 80 AND MD 109	78%	71%	66%	74%	95%	87%	88%	96%
BETWEEN MD 109 AND MD 121	78%	67%	67%	76%	93%	87%	87%	94%
BETWEEN MD 121 AND MD 27	76%	69%	69%	85%	94%	90%	88%	91%
BETWEEN MD 27 AND MD 118	70%	77%	72%	89%	94%	90%	89%	90%
BETWEEN MD 118 AND MIDDLEBROOK RD	73%	79%	78%	91%	92%	89%	86%	89%
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	76%	83%	84%	94%	93%	89%	86%	89%
BETWEEN WATKINS MILL AND MD 124	64%	70%	70%	80%	73%	68%	68%	63%
BETWEEN MD 124 AND MD 117	74%	81%	82%	93%	97%	91%	90%	90%
BETWEEN MD 117 AND I-370	77%	83%	85%	96%	97%	92%	90%	90%
BETWEEN I-370 AND SHADY GROVE RD	82%	86%	88%	95%	96%	89%	88%	88%
BETWEEN SHADY GROVE RD AND MD 28	83%	87%	88%	96%	97%	89%	88%	86%
BETWEEN MD 28 AND MD 189	84%	89%	90%	96%	100%	100%	100%	99%
BETWEEN MD 189 AND MONTROSE RD	84%	90%	93%	96%	95%	90%	89%	85%
BETWEEN MONTROSE RD AND I-270 SPLIT	86%	90%	94%	97%	93%	90%	88%	84%
BETWEEN I-270 SPLIT AND MD 187	85%	89%	95%	98%	84%	90%	90%	76%
BETWEEN MD 187 AND I-495	85%	91%	96%	97%	82%	87%	88%	73%
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	85%	87%	88%	87%	98%	88%	83%	86%
BETWEEN DEMOCRACY BLVD AND I-495	86%	91%	96%	95%	100%	90%	84%	89%

I-495 Throughput	Inner Loop				Outer Loop			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN VA-193 AND GW MEMORIAL PKWY	5879	5458	3532	2859	6983	6923	7036	6453
AMERICAN LEGION BRIDGE	8627	8527	5776	4611	8561	8475	8645	7825
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	7681	7328	4879	3855	7114	7029	7026	6311
BETWEEN MD 190 AND I-270	8857	8179	5657	4274	7654	7601	7653	5912
BETWEEN I-270 WEST AND MD 187	4064	3313	2208	2245	4323	3471	4127	1829
BETWEEN I-270 EAST AND MD 187	3715	2667	2163	3163	4267	3303	3683	827
BETWEEN MD 355 AND MD 185	7172	6523	5551	7197	7911	6940	7066	2044
BETWEEN MD 185 AND MD 97	7886	7340	6456	7129	7801	7194	6587	2963
BETWEEN MD 97 AND US 29	8139	7754	6717	6649	7340	7404	6078	3504
BETWEEN MD US 29 AND MD 193	7875	7619	6714	6521	6684	6779	5374	3282
BETWEEN MD 193 AND MD 650	8074	8107	7360	7009	6942	7009	5882	4136
BETWEEN MD 650 AND I-95	8765	8537	8243	7607	7337	7344	6820	4878
BETWEEN US 1 AND I-95	6189	6166	6257	5918	8923	9096	9238	8679
BETWEEN GREENBELT STATION AND US 1	7888	7719	7796	7541	8310	8408	8402	8231
BETWEEN GREENBELT STATION AND MD 201	7899	7784	7803	7432	7936	7893	7955	8014
BETWEEN MD 201 AND MD 295	7766	7731	7626	7317	6938	6758	6763	7010
BETWEEN MD 295 AND MD 450	7791	7592	7238	6408	6708	5900	5896	6734
BETWEEN MD 450 AND US 50	8422	8020	7995	7055	7091	6503	6525	7304
BETWEEN US 50 AND MD 202	8536	8376	8430	7730	7019	7290	6772	6869
BETWEEN MD 202 AND ARENA DR	8250	8065	8230	7639	6636	6892	6533	6967
BETWEEN ARENA DR AND MD 214	8207	7756	7854	7298	6775	6710	6441	6792
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7873	7801	7898	7253	7227	6568	6450	6752
BETWEEN RITCHIE MARLBORO AND MD 4	7155	7389	7717	7210	7210	6722	6227	6240
BETWEEN MD 4 AND FORESTVILLE RD	6724	7299	7466	7229	7169	6704	5723	6087
BETWEEN FORESTVILLE AND MD 218	6284	6833	7076	6701	6112	5757	4984	5372
BETWEEN MD 218 AND MD 5	6940	7569	7880	7272	6681	6235	5254	5744
BETWEEN MD 5 AND MD 414	5608	6291	6518	5815	6449	6206	5880	5991
BETWEEN MD 414 AND MD 210	5363	6152	6315	5480	7048	7254	7238	6660
BETWEEN MD 210 AND I-295	5495	6335	6473	5569	7267	7441	7543	7019
WOODROW WILSON BRIDGE	7548	8568	8855	7830	8790	8769	8705	8949

I-270 Throughput	Southbound				Northbound			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN MD 85 AND MD 80	2513	2803	3152	2962	4233	4197	4109	3782
BETWEEN MD 80 AND MD 109	2431	2835	3105	2946	4304	4199	4249	3870
BETWEEN MD 109 AND MD 121	2518	2836	3209	2984	4359	4254	4314	3836
BETWEEN MD 121 AND MD 27	3103	3278	3791	3537	5156	4721	4863	4700
BETWEEN MD 27 AND MD 118	3682	3857	3946	4016	6508	5361	5580	5932
BETWEEN MD 118 AND MIDDLEBROOK RD	3810	4169	4226	4320	7217	5665	5654	6368
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	4795	5128	5406	5425	8211	6760	6559	7680
BETWEEN WATKINS MILL AND MD 124	3359	3520	3768	3932	5986	5035	4684	5424
BETWEEN MD 124 AND MD 117	5363	5355	5658	5818	8669	6657	6692	7326
BETWEEN MD 117 AND I-370	6765	7038	7475	7174	10138	7698	7767	8737
BETWEEN I-370 AND SHADY GROVE RD	7294	6988	6572	7751	10795	8346	6403	8815
BETWEEN SHADY GROVE RD AND MD 28	7629	7387	6792	8566	11030	9845	5533	7285
BETWEEN MD 28 AND MD 189	8290	8190	7674	9281	12071	11867	6035	7272
BETWEEN MD 189 AND MONTROSE RD	8052	8030	7409	9020	11835	11562	6537	6348
BETWEEN MONTROSE RD AND I-270 SPLIT	7970	8237	7046	8432	11277	11009	7288	5216
BETWEEN I-270 SPLIT AND MD 187	3830	3868	3297	4083	5171	4935	3787	1421
BETWEEN MD 187 AND I-495	3874	3848	3379	3613	4419	4038	3533	913
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	4013	4302	3668	4188	5468	5375	3758	2634
BETWEEN DEMOCRACY BLVD AND I-495	3884	4065	3238	3640	4930	4623	3343	2167

2045 No-Build PM MOEs - Percent Vehicle Demand Met

2/1/2022

I-495 Percent Vehicle Demand Met	Inner Loop				Outer Loop			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN VA-193 AND GW MEMORIAL PKWY	78%	70%	46%	45%	85%	80%	85%	83%
AMERICAN LEGION BRIDGE	94%	90%	61%	57%	88%	83%	88%	85%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	91%	90%	62%	55%	88%	86%	88%	83%
BETWEEN MD 190 AND I-270	85%	80%	59%	50%	90%	86%	90%	77%
BETWEEN I-270 WEST AND MD 187	79%	67%	49%	58%	91%	75%	92%	47%
BETWEEN I-270 EAST AND MD 187	76%	57%	51%	89%	96%	77%	87%	23%
BETWEEN MD 355 AND MD 185	82%	74%	68%	99%	94%	82%	82%	26%
BETWEEN MD 185 AND MD 97	82%	76%	74%	92%	95%	85%	78%	39%
BETWEEN MD 97 AND US 29	82%	78%	75%	85%	92%	87%	71%	48%
BETWEEN MD US 29 AND MD 193	83%	80%	78%	89%	90%	85%	69%	50%
BETWEEN MD 193 AND MD 650	85%	83%	82%	89%	90%	85%	70%	60%
BETWEEN MD 650 AND I-95	87%	82%	86%	89%	89%	82%	77%	65%
BETWEEN US 1 AND I-95	72%	67%	76%	90%	89%	86%	95%	100%
BETWEEN GREENBELT STATION AND US 1	81%	76%	85%	100%	87%	84%	93%	100%
BETWEEN GREENBELT STATION AND MD 201	81%	78%	87%	100%	85%	81%	92%	100%
BETWEEN MD 201 AND MD 295	84%	80%	88%	100%	82%	77%	90%	100%
BETWEEN MD 295 AND MD 450	87%	85%	91%	100%	90%	80%	92%	100%
BETWEEN MD 450 AND US 50	89%	87%	93%	100%	89%	82%	91%	100%
BETWEEN US 50 AND MD 202	92%	92%	94%	100%	86%	88%	90%	99%
BETWEEN MD 202 AND ARENA DR	93%	92%	95%	100%	82%	84%	87%	99%
BETWEEN ARENA DR AND MD 214	93%	92%	96%	99%	85%	83%	87%	98%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	95%	93%	97%	100%	91%	80%	82%	96%
BETWEEN RITCHIE MARLBORO AND MD 4	96%	94%	96%	100%	92%	84%	80%	92%
BETWEEN MD 4 AND FORESTVILLE RD	96%	94%	97%	100%	91%	85%	74%	92%
BETWEEN FORESTVILLE AND MD 218	96%	94%	97%	100%	91%	87%	77%	95%
BETWEEN MD 218 AND MD 5	97%	94%	98%	100%	94%	88%	76%	94%
BETWEEN MD 5 AND MD 414	95%	94%	97%	99%	90%	88%	84%	98%
BETWEEN MD 414 AND MD 210	96%	96%	97%	100%	91%	91%	92%	96%
BETWEEN MD 210 AND I-295	97%	95%	98%	100%	89%	90%	90%	95%
WOODROW WILSON BRIDGE	98%	95%	100%	100%	88%	88%	86%	96%

<90%	>90%	100%

I-270 Percent Vehicle Demand Met	Southbound				Northbound			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN MD 85 AND MD 80	100%	98%	98%	99%	86%	80%	82%	93%
BETWEEN MD 80 AND MD 109	100%	99%	98%	100%	85%	78%	81%	90%
BETWEEN MD 109 AND MD 121	100%	96%	98%	99%	83%	77%	79%	84%
BETWEEN MD 121 AND MD 27	100%	95%	97%	98%	88%	75%	77%	85%
BETWEEN MD 27 AND MD 118	100%	97%	97%	100%	91%	72%	74%	86%
BETWEEN MD 118 AND MIDDLEBROOK RD	100%	97%	96%	98%	90%	71%	70%	87%
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	100%	97%	97%	99%	89%	71%	70%	88%
BETWEEN WATKINS MILL AND MD 124	77%	73%	76%	79%	69%	56%	51%	64%
BETWEEN MD 124 AND MD 117	100%	90%	91%	98%	92%	68%	67%	81%
BETWEEN MD 117 AND I-370	100%	92%	94%	99%	94%	67%	68%	83%
BETWEEN I-370 AND SHADY GROVE RD	100%	93%	84%	100%	99%	71%	56%	82%
BETWEEN SHADY GROVE RD AND MD 28	100%	92%	78%	100%	100%	85%	49%	70%
BETWEEN MD 28 AND MD 189	100%	93%	81%	100%	100%	92%	48%	62%
BETWEEN MD 189 AND MONTROSE RD	100%	93%	81%	100%	99%	91%	52%	54%
BETWEEN MONTROSE RD AND I-270 SPLIT	100%	94%	79%	99%	98%	89%	59%	46%
BETWEEN I-270 SPLIT AND MD 187	97%	93%	80%	97%	98%	85%	65%	25%
BETWEEN MD 187 AND I-495	98%	91%	82%	90%	97%	85%	74%	19%
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	100%	93%	77%	97%	87%	82%	58%	46%
BETWEEN DEMOCRACY BLVD AND I-495	100%	97%	81%	97%	94%	86%	66%	46%

I-495 Throughput	Inner Loop				Outer Loop			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
BETWEEN VA-193 AND GW MEMORIAL PKWY	9172	10070	9436	8892	9538	10414	10437	9555
AMERICAN LEGION BRIDGE	9572	11196	10891	10341	9980	11150	10764	9859
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	9124	10701	10338	9777	9823	10511	9530	8878
BETWEEN MD 190 AND I-270	9045	10732	10669	10321	11829	12320	11173	10185
BETWEEN I-270 WEST AND MD 187	4884	5458	4532	4378	4683	5700	5068	4797
BETWEEN I-270 EAST AND MD 187	4516	4573	3949	4251	3643	4450	3928	3739
BETWEEN MD 355 AND MD 185	6805	7997	7919	7963	6542	7953	8452	7248
BETWEEN MD 185 AND MD 97	6383	7415	7843	7771	7564	8240	8202	7017
BETWEEN MD 97 AND US 29	6200	7370	7626	7587	6925	7053	6545	5728
BETWEEN MD US 29 AND MD 193	6230	7120	7351	7320	6374	6302	5890	5122
BETWEEN MD 193 AND MD 650	6544	7537	7723	7615	6086	5972	5803	5053
BETWEEN MD 650 AND I-95	7666	8288	8049	7757	7079	6237	6558	5774
BETWEEN US 1 AND I-95	6696	6088	6264	6528	8133	8194	8079	7611
BETWEEN GREENBELT STATION AND US 1	7555	7072	7494	7603	8438	8524	8352	7609
BETWEEN GREENBELT STATION AND MD 201	7255	6740	7241	7321	8396	8680	8234	7583
BETWEEN MD 201 AND MD 295	6611	6203	7142	6926	8347	8764	8151	7562
BETWEEN MD 295 AND MD 450	5964	5771	6841	6370	8195	8339	7925	7542
BETWEEN MD 450 AND US 50	6510	6261	7425	6951	8120	8406	8237	8010
BETWEEN US 50 AND MD 202	7449	7226	8285	7553	7232	7239	7094	7043
BETWEEN MD 202 AND ARENA DR	7479	7077	8030	6868	6915	6494	7214	6640
BETWEEN ARENA DR AND MD 214	7468	7068	7270	6627	7189	6548	7288	6646
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7422	7002	5944	7264	6893	6378	6070	6611
BETWEEN RITCHIE MARLBORO AND MD 4	7452	6717	4965	8121	7216	5836	4477	7224
BETWEEN MD 4 AND FORESTVILLE RD	7549	5889	4996	7919	6023	5166	3308	7161
BETWEEN FORESTVILLE AND MD 218	6854	4922	4681	7545	5354	4151	2384	6974
BETWEEN MD 218 AND MD 5	6980	4337	5534	7913	6204	4653	2842	8003
BETWEEN MD 5 AND MD 414	6594	3182	5238	7216	5003	5731	2379	7436
BETWEEN MD 414 AND MD 210	5725	3603	5828	7244	4804	5348	2889	6578
BETWEEN MD 210 AND I-295	7010	5282	6741	7960	4721	5456	4304	5109
WOODROW WILSON BRIDGE	9533	9067	9507	9368	7506	8619	7859	6836

I-270 Throughput	Southbound				Northbound			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
BETWEEN MD 85 AND MD 80	3041	2941	2631	2869	2387	3120	3601	3303
BETWEEN MD 80 AND MD 109	3697	3705	3281	3668	2280	2964	3246	3150
BETWEEN MD 109 AND MD 121	4113	3855	3926	3938	2354	3086	3318	3209
BETWEEN MD 121 AND MD 27	5066	4528	4997	5015	2820	3396	3584	3470
BETWEEN MD 27 AND MD 118	5368	5310	5202	5651	2968	3711	4008	3871
BETWEEN MD 118 AND MIDDLEBROOK RD	5907	5736	5677	6009	3087	3919	4260	4378
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	7738	7499	7211	7539	3563	4557	5054	5217
BETWEEN WATKINS MILL AND MD 124	6957	6849	6759	6798	3518	4712	5436	5622
BETWEEN MD 124 AND MD 117	7968	7854	7649	7773	3633	4991	6103	6001
BETWEEN MD 117 AND I-370	9815	9719	9503	9456	4192	5949	7559	7132
BETWEEN I-370 AND SHADY GROVE RD	10275	9768	8921	8764	3864	4838	6302	5944
BETWEEN SHADY GROVE RD AND MD 28	11700	10539	9680	9616	4819	6160	7990	7474
BETWEEN MD 28 AND MD 189	12458	11629	10662	10437	5242	6478	8761	8044
BETWEEN MD 189 AND MONTROSE RD	12426	12042	11374	10848	4948	6187	8389	7743
BETWEEN MONTROSE RD AND I-270 SPLIT	12295	12587	12528	11166	5782	7268	9550	8770
BETWEEN I-270 SPLIT AND MD 187	4161	5230	5615	5048	1946	2855	4260	3550
BETWEEN MD 187 AND I-495	3327	4156	4429	4068	2586	3645	4939	3918
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	8154	7230	6981	6195	3435	3985	4835	4730
BETWEEN DEMOCRACY BLVD AND I-495	2736	3009	3257	3104	4212	5186	6041	5843

I-495 Percent Vehicle Demand Met	Inner Loop				Outer Loop			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
BETWEEN VA-193 AND GW MEMORIAL PKWY	100%	100%	100%	100%	100%	100%	100%	100%
AMERICAN LEGION BRIDGE	98%	99%	100%	100%	87%	90%	97%	96%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	99%	100%	100%	100%	87%	90%	96%	95%
BETWEEN MD 190 AND I-270	98%	97%	98%	99%	86%	89%	95%	93%
BETWEEN I-270 WEST AND MD 187	99%	97%	98%	98%	93%	94%	100%	99%
BETWEEN I-270 EAST AND MD 187	100%	89%	90%	98%	78%	83%	91%	86%
BETWEEN MD 355 AND MD 185	96%	87%	95%	100%	77%	81%	92%	84%
BETWEEN MD 185 AND MD 97	97%	86%	95%	100%	74%	78%	91%	78%
BETWEEN MD 97 AND US 29	97%	87%	95%	99%	69%	75%	88%	72%
BETWEEN MD US 29 AND MD 193	98%	88%	95%	100%	71%	78%	93%	76%
BETWEEN MD 193 AND MD 650	99%	89%	94%	100%	69%	77%	95%	76%
BETWEEN MD 650 AND I-95	98%	90%	95%	100%	74%	74%	92%	78%
BETWEEN US 1 AND I-95	89%	70%	74%	81%	91%	89%	98%	99%
BETWEEN GREENBELT STATION AND US 1	90%	71%	75%	86%	91%	88%	98%	97%
BETWEEN GREENBELT STATION AND MD 201	91%	71%	76%	87%	90%	88%	95%	96%
BETWEEN MD 201 AND MD 295	93%	74%	80%	88%	90%	87%	92%	96%
BETWEEN MD 295 AND MD 450	95%	78%	84%	91%	88%	84%	89%	92%
BETWEEN MD 450 AND US 50	96%	80%	86%	93%	87%	83%	88%	92%
BETWEEN US 50 AND MD 202	99%	86%	91%	94%	84%	76%	84%	88%
BETWEEN MD 202 AND ARENA DR	100%	87%	91%	87%	81%	69%	86%	84%
BETWEEN ARENA DR AND MD 214	100%	87%	85%	86%	83%	69%	84%	84%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	100%	89%	75%	98%	84%	68%	72%	88%
BETWEEN RITCHIE MARLBORO AND MD 4	100%	86%	64%	100%	99%	69%	58%	99%
BETWEEN MD 4 AND FORESTVILLE RD	100%	79%	63%	100%	100%	72%	52%	100%
BETWEEN FORESTVILLE AND MD 218	100%	72%	64%	100%	100%	67%	44%	100%
BETWEEN MD 218 AND MD 5	99%	61%	73%	100%	100%	66%	46%	100%
BETWEEN MD 5 AND MD 414	87%	51%	77%	100%	98%	96%	44%	100%
BETWEEN MD 414 AND MD 210	72%	58%	87%	100%	100%	98%	58%	100%
BETWEEN MD 210 AND I-295	74%	71%	90%	100%	100%	99%	87%	100%
WOODROW WILSON BRIDGE	83%	83%	91%	100%	100%	100%	99%	99%

<90%	>90%	100%

I-270 Percent Vehicle Demand Met	Southbound				Northbound			
	6-7 AM	7-8 AM	8-9 AM	9-10 AM	6-7 AM	7-8 AM	8-9 AM	9-10 AM
BETWEEN MD 85 AND MD 80	71%	68%	62%	78%	95%	85%	95%	100%
BETWEEN MD 80 AND MD 109	76%	73%	68%	87%	95%	88%	92%	100%
BETWEEN MD 109 AND MD 121	77%	69%	74%	86%	93%	88%	91%	100%
BETWEEN MD 121 AND MD 27	78%	68%	81%	92%	94%	91%	92%	98%
BETWEEN MD 27 AND MD 118	72%	79%	83%	96%	93%	91%	94%	98%
BETWEEN MD 118 AND MIDDLEBROOK RD	75%	82%	85%	97%	92%	92%	93%	98%
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	79%	85%	88%	100%	92%	90%	92%	98%
BETWEEN WATKINS MILL AND MD 124	78%	88%	90%	100%	92%	90%	93%	99%
BETWEEN MD 124 AND MD 117	75%	84%	85%	98%	96%	91%	94%	100%
BETWEEN MD 117 AND I-370	79%	86%	88%	99%	96%	92%	95%	99%
BETWEEN I-370 AND SHADY GROVE RD	76%	83%	81%	86%	91%	82%	86%	87%
BETWEEN SHADY GROVE RD AND MD 28	89%	97%	97%	100%	100%	100%	100%	100%
BETWEEN MD 28 AND MD 189	87%	93%	94%	99%	91%	82%	87%	88%
BETWEEN MD 189 AND MONTROSE RD	87%	92%	95%	99%	86%	81%	84%	85%
BETWEEN MONTROSE RD AND I-270 SPLIT	88%	92%	99%	98%	92%	91%	95%	94%
BETWEEN I-270 SPLIT AND MD 187	87%	89%	100%	100%	81%	85%	93%	90%
BETWEEN MD 187 AND I-495	88%	90%	100%	100%	81%	83%	93%	88%
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	89%	92%	98%	98%	89%	86%	88%	88%
BETWEEN DEMOCRACY BLVD AND I-495	31%	39%	47%	51%	98%	95%	97%	97%

I-495 Throughput	Inner Loop				Outer Loop			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN VA-193 AND GW MEMORIAL PKWY	7608	7798	6388	7904	8624	8630	7806	5786
AMERICAN LEGION BRIDGE	11983	12019	8706	8558	10569	10453	9758	6758
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	8971	8381	5993	8987	9516	8998	8401	5512
BETWEEN MD 190 AND I-270	11867	9491	9176	11206	9878	9771	9194	5167
BETWEEN I-270 WEST AND MD 187	4285	2646	3218	4188	5110	4631	4432	2199
BETWEEN I-270 EAST AND MD 187	4136	2892	3806	4821	4817	4360	4152	1591
BETWEEN MD 355 AND MD 185	7938	7107	7415	6757	8364	8199	7983	3421
BETWEEN MD 185 AND MD 97	8640	7808	7865	7107	8235	7919	7854	4357
BETWEEN MD 97 AND US 29	8833	8015	8201	7155	7819	7753	7761	5456
BETWEEN MD US 29 AND MD 193	8393	8049	7888	6697	7063	6984	6859	5533
BETWEEN MD 193 AND MD 650	8400	8375	8357	7196	7275	7263	7285	7124
BETWEEN MD 650 AND I-95	9009	9007	8948	7788	7708	7632	7672	7667
BETWEEN US 1 AND I-95	6594	6520	6646	6352	9262	9356	9486	9064
BETWEEN GREENBELT STATION AND US 1	8276	8157	8107	7943	8623	8740	8594	8607
BETWEEN GREENBELT STATION AND MD 201	8295	8147	8079	7854	8281	8247	8292	8387
BETWEEN MD 201 AND MD 295	8078	7947	7868	7553	7390	7144	7200	7256
BETWEEN MD 295 AND MD 450	8050	7749	7483	6588	6864	6502	6466	6159
BETWEEN MD 450 AND US 50	8596	8121	8108	7328	7184	7216	6909	6603
BETWEEN US 50 AND MD 202	8731	8516	8523	7883	7367	7489	7344	7292
BETWEEN MD 202 AND ARENA DR	8394	8035	8360	7798	7257	7239	7282	7507
BETWEEN ARENA DR AND MD 214	8189	7713	7946	7612	7374	7137	7191	7456
BETWEEN MD 214 AND RITCHIE MARLBORO RD	7849	7732	7999	7559	7729	7516	7293	7562
BETWEEN RITCHIE MARLBORO AND MD 4	7117	7368	7795	7410	7437	7692	7333	7161
BETWEEN MD 4 AND FORESTVILLE RD	6680	7245	7539	7402	7438	7485	7238	7096
BETWEEN FORESTVILLE AND MD 218	6261	6767	7130	6861	6407	6261	6132	6057
BETWEEN MD 218 AND MD 5	6914	7535	7847	7465	6855	6790	6503	6393
BETWEEN MD 5 AND MD 414	5542	6239	6581	6040	6701	6494	6616	6113
BETWEEN MD 414 AND MD 210	5285	6062	6364	5618	7354	7710	7735	7081
BETWEEN MD 210 AND I-295	5436	6266	6529	5695	7681	7968	8164	7573
WOODROW WILSON BRIDGE	7511	8546	8851	7985	9409	9640	9648	9760

I-270 Throughput	Southbound				Northbound			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN MD 85 AND MD 80	2568	2882	3131	2927	4205	4149	4125	3904
BETWEEN MD 80 AND MD 109	2519	2907	3090	2956	4255	4216	4237	4074
BETWEEN MD 109 AND MD 121	2629	2872	3287	3027	4358	4323	4256	4262
BETWEEN MD 121 AND MD 27	3236	3413	3842	3649	5297	4956	5004	4843
BETWEEN MD 27 AND MD 118	3822	3978	4088	4076	6510	5925	5786	6027
BETWEEN MD 118 AND MIDDLEBROOK RD	3945	4291	4292	4370	7392	6594	6179	6422
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	4982	5309	5479	5466	8555	7949	7295	7717
BETWEEN WATKINS MILL AND MD 124	4606	4742	4893	4772	8190	7873	6996	7544
BETWEEN MD 124 AND MD 117	5578	5844	6095	5731	8988	8633	7384	7979
BETWEEN MD 117 AND I-370	7003	7569	7896	7126	10491	10173	8489	9222
BETWEEN I-370 AND SHADY GROVE RD	7541	7797	8037	7267	11359	10577	7500	9006
BETWEEN SHADY GROVE RD AND MD 28	8384	8741	9353	6648	11849	11212	7337	8050
BETWEEN MD 28 AND MD 189	8970	9346	9972	5765	13078	13019	7830	8571
BETWEEN MD 189 AND MONTROSE RD	8791	9157	9134	4288	12944	13036	8977	8451
BETWEEN MONTROSE RD AND I-270 SPLIT	9208	9615	9113	4624	12547	12567	10267	8260
BETWEEN I-270 SPLIT AND MD 187	4170	4106	3918	1693	4840	5345	4386	1821
BETWEEN MD 187 AND I-495	4019	4003	3726	1769	4297	4412	4275	1337
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	5011	5480	5218	3006	6517	5924	5528	5376
BETWEEN DEMOCRACY BLVD AND I-495	4244	4610	4239	2624	6791	5744	5800	6512

I-495 Percent Vehicle Demand Met	Inner Loop				Outer Loop			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN VA-193 AND GW MEMORIAL PKWY	100%	100%	84%	100%	100%	96%	91%	72%
AMERICAN LEGION BRIDGE	100%	100%	90%	100%	100%	95%	93%	67%
BETWEEN CLARA BARTON PARKWAY AND CABIN JOHN PARKWAY	100%	95%	72%	100%	100%	95%	92%	62%
BETWEEN MD 190 AND I-270	100%	83%	86%	100%	100%	96%	95%	57%
BETWEEN I-270 WEST AND MD 187	83%	53%	71%	100%	99%	95%	93%	52%
BETWEEN I-270 EAST AND MD 187	84%	61%	90%	100%	99%	96%	93%	42%
BETWEEN MD 355 AND MD 185	89%	81%	92%	93%	96%	96%	93%	44%
BETWEEN MD 185 AND MD 97	90%	83%	91%	92%	98%	93%	93%	58%
BETWEEN MD 97 AND US 29	89%	82%	93%	92%	96%	90%	90%	74%
BETWEEN MD US 29 AND MD 193	89%	85%	93%	92%	94%	88%	88%	85%
BETWEEN MD 193 AND MD 650	89%	87%	94%	92%	94%	88%	87%	100%
BETWEEN MD 650 AND I-95	90%	88%	95%	92%	93%	85%	87%	100%
BETWEEN US 1 AND I-95	77%	74%	81%	96%	92%	88%	97%	100%
BETWEEN GREENBELT STATION AND US 1	85%	81%	89%	100%	91%	87%	96%	100%
BETWEEN GREENBELT STATION AND MD 201	85%	81%	90%	100%	89%	85%	96%	100%
BETWEEN MD 201 AND MD 295	87%	83%	90%	100%	88%	82%	96%	100%
BETWEEN MD 295 AND MD 450	89%	86%	93%	100%	93%	89%	102%	100%
BETWEEN MD 450 AND US 50	90%	88%	94%	100%	92%	93%	99%	100%
BETWEEN US 50 AND MD 202	93%	93%	95%	100%	90%	90%	97%	100%
BETWEEN MD 202 AND ARENA DR	94%	92%	97%	100%	90%	89%	97%	100%
BETWEEN ARENA DR AND MD 214	93%	92%	97%	100%	93%	89%	97%	100%
BETWEEN MD 214 AND RITCHIE MARLBORO RD	94%	93%	98%	100%	97%	92%	93%	100%
BETWEEN RITCHIE MARLBORO AND MD 4	96%	94%	98%	100%	96%	96%	95%	100%
BETWEEN MD 4 AND FORESTVILLE RD	96%	94%	98%	100%	96%	96%	95%	100%
BETWEEN FORESTVILLE AND MD 218	96%	94%	98%	100%	97%	95%	96%	100%
BETWEEN MD 218 AND MD 5	97%	94%	98%	100%	97%	96%	94%	100%
BETWEEN MD 5 AND MD 414	95%	94%	98%	100%	95%	93%	95%	100%
BETWEEN MD 414 AND MD 210	96%	95%	99%	100%	96%	98%	99%	100%
BETWEEN MD 210 AND I-295	97%	95%	100%	100%	95%	97%	99%	100%
WOODROW WILSON BRIDGE	98%	95%	100%	100%	94%	97%	96%	100%

<90%	>90%	100%

I-270 Percent Vehicle Demand Met	Southbound				Northbound			
	3-4 PM	4-5 PM	5-6 PM	6-7 PM	3-4 PM	4-5 PM	5-6 PM	6-7 PM
BETWEEN MD 85 AND MD 80	100%	99%	98%	99%	85%	79%	82%	94%
BETWEEN MD 80 AND MD 109	100%	99%	97%	100%	83%	78%	79%	92%
BETWEEN MD 109 AND MD 121	100%	95%	99%	100%	82%	77%	77%	91%
BETWEEN MD 121 AND MD 27	100%	96%	97%	100%	87%	76%	77%	84%
BETWEEN MD 27 AND MD 118	100%	98%	97%	100%	90%	79%	76%	86%
BETWEEN MD 118 AND MIDDLEBROOK RD	100%	97%	96%	99%	91%	81%	75%	86%
BETWEEN MIDDLEBROOK RD AND WATKINS MILL	100%	98%	97%	99%	91%	83%	76%	87%
BETWEEN WATKINS MILL AND MD 124	99%	94%	95%	93%	93%	87%	76%	89%
BETWEEN MD 124 AND MD 117	100%	95%	95%	94%	95%	87%	73%	86%
BETWEEN MD 117 AND I-370	100%	96%	97%	96%	96%	88%	73%	87%
BETWEEN I-370 AND SHADY GROVE RD	100%	100%	100%	94%	100%	87%	64%	81%
BETWEEN SHADY GROVE RD AND MD 28	100%	100%	100%	84%	100%	98%	67%	78%
BETWEEN MD 28 AND MD 189	100%	99%	100%	61%	100%	96%	60%	69%
BETWEEN MD 189 AND MONTROSE RD	100%	98%	93%	46%	100%	98%	68%	68%
BETWEEN MONTROSE RD AND I-270 SPLIT	100%	98%	92%	48%	100%	97%	80%	69%
BETWEEN I-270 SPLIT AND MD 187	100%	96%	91%	39%	99%	97%	79%	35%
BETWEEN MD 187 AND I-495	100%	96%	91%	45%	99%	99%	95%	29%
BETWEEN I-270 SPLIT AND DEMOCRACY BLVD	100%	98%	94%	57%	90%	79%	76%	79%
BETWEEN DEMOCRACY BLVD AND I-495	90%	87%	86%	55%	100%	89%	95%	100%

APPENDIX H:

Existing and Future Level of Service

Existing AM - I-495 OL Link Evaluation Results

Existing AM
I-495 OL

	WWB								Exit 2 I-295			Exit 3 MD 210									Exit 4 MD 414													
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	26	25	26	52	56	57	58	59	58	58	58	59	59	59	59	58	59	59	59	59	58	59	59	54	53	53	53	53	53	53	53	53	53	53
Density	64	64	70	35	32	31	23	15	19	19	16	16	19	18	17	21	21	17	20	20	17	20	19	19	23	24	24	24	24	24	24	19	20	20
LOS	F	F	F	D	D	D	C	B	C	C	B	B	C	C	B	C	C	B	C	C	B	C	C	C	C	C	C	C	C	C	C	C	C	C
Volume	8251	8143	5395	5381	5392	5391	2642	2643	2180	2183	2812	2823	2275	4281	4982	4984	4974	4938	4761	4773	5052	4614	4610	5033	4929	5072	5063	5075	5081	5080	5055	5032	4227	4218
Lanes	5	5	3	3	3	3	2	3	2	2	3	3	2	4	5	4	4	5	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4
Length	2000	1268	2000	2000	2000	195	1182	890	2000	1282	2000	1297	1256	824	1314	1054	1042	448	914	495	674	410	694	1037	428	2000	2000	2000	2000	1655	912	602	729	508
LinkID	1	1	218503	218503	218503	218503	218507	218508	218509	218509	318105	318105	217308	217315	217316	971	972	217318	216105	973	216107	216110	974	216112	216115	979	979	979	979	979	980	216114	215901	981
SegmentID	1	2	1	2	3	4	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1

🟥	🟧	🟨	🟩	🟩	Speed Color Scale (mph)
10	30	40	50	70	

	Exit 7 MD 5									Exit 9 MD 337								Exit 11 MD 4											Exit 13 Ritchie Marlboro Rd					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	53	54	54	53	52	54	53	52	55	54	54	51	50	53	54	55	55	52	53	54	54	51	56	56	55	55	55	55	55	55	50	51	54	55
Density	18	20	20	24	31	29	30	31	26	26	26	26	34	31	31	28	28	26	29	28	27	35	33	33	33	33	33	27	31	31	33	41	38	37
LOS	B	C	C	C	D	D	D	D	C	D	D	D	D	D	D	D	D	D	D	D	D	E	D	D	D	D	D	D	D	D	D	E	E	E
Volume	4671	4338	4327	6399	6337	6393	6383	6380	5666	5663	5657	6686	6694	6638	6675	6200	6185	6777	6067	6064	7304	7297	7327	7323	7335	7323	7282	7340	6928	6921	8346	8346	8327	8153
Lanes	5	4	4	5	4	4	4	4	4	4	4	5	4	4	4	4	4	5	4	4	5	4	4	4	4	4	4	5	4	4	5	4	4	4
Length	1080	481	657	677	798	2000	773	1493	2000	2000	1594	706	788	515	1390	726	505	449	551	554	462	1023	2000	2000	2000	933	536	940	2000	518	1353	2000	1046	208
LinkID	215904	215905	982	215907	215908	983	983	984	214702	214702	214702	213501	213502	985	986	212301	992	212303	212305	1003	212307	212308	1004	1004	1004	1004	1005	212309	211206	211206	211212	1006	1006	1020
SegmentID	1	1	1	1	1	1	2	1	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	2	1	1	2	1

			Exit 15 MD 214					Exit 16 Arena Dr		Exit 17 MD 202										Exit 19 US 50							Exit 20 MD 450							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	56	56	54	53	53	50	47	47	40	35	31	21	24	24	48	54	55	59	57	58	58	58	58	55	49	36	32	27	20	34	54	58	58	55
Density	30	31	28	36	31	33	41	33	44	50	56	63	65	64	41	36	35	27	30	24	26	26	26	26	35	55	49	72	86	63	40	38	37	40
LOS	D	D	D	E	D	D	E	D	E	F	F	F	F	F	E	E	E	D	D	C	C	C	C	C	D	F	F	F	F	F	E	E	E	E
Volume	8310	7078	7711	7679	8310	8314	7690	7712	5336	5261	5203	7889	7796	7802	7757	7785	7791	7795	6859	6852	5965	5965	5964	8561	8598	8006	7905	7794	8745	8657	8707	8698	8703	8690
Lanes	5	4	5	4	5	5	4	5	3	3	3	6	5	5	4	4	4	5	4	5	4	4	4	6	5	4	5	4	5	4	4	4	4	4
Length	1288	1160	803	743	1378	1328	648	1500	2000	2000	1019	1002	499	722	2000	1520	793	705	785	562	2000	276	288	800	1391	716	276	949	1042	455	2000	2000	2000	1837
LinkID	211214	210903	210905	210906	210909	1022	209703	209704	209710	209710	209710	208515	208516	1023	326	326	1024	208518	207302	207303	207305	207305	1025	207306	207307	206101	206102	206104	206108	206109	1027	1027	1027	1027
SegmentID	1	1	1	1	1	1	1	1	1	2	3	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	3	4

					Exit 22 MD 295						Exit 23 MD 201					Exit 24 Greenbelt Metro Station						Exit 25 US 1						Exit 27 I-95						
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	57	57	53	53	51	50	51	52	51	53	49	50	54	52	53	53	58	57	56	55	57	58	58	58	57	58	59	59	58	41	8	9	9	9
Density	38	30	34	34	32	41	40	34	35	34	31	39	30	38	38	37	28	35	36	32	30	25	22	22	23	19	18	15	19	27	134	123	124	131
LOS	E	D	D	D	D	E	E	D	E	D	D	E	D	E	E	E	D	D	E	D	D	C	C	C	C	C	C	B	C	D	F	F	F	F
Volume	8659	8636	7137	7161	8270	8162	8190	8647	7205	7243	7641	7706	7918	7882	7912	7872	7947	7964	7958	6907	6883	7266	7688	7679	7682	4308	4273	4375	4413	4388	6477	6423	6372	5879
Lanes	4	5	4	4	5	4	4	5	4	4	5	4	5	4	4	4	5	4	4	4	4	5	6	6	6	4	4	5	4	4	6	6	6	5
Length	903	595	570	541	439	501	699	1815	589	828	434	995	471	993	2000	1085	1301	1225	1250	244	973	1149	1517	673	1486	2000	355	1017	490	825	1506	839	1513	814
LinkID	1029	206110	205903	1030	205905	205907	1031	205909	204704	1032	204706	204707	204709	204710	1033	1033	203501	1034	1036	20020	202306	202308	202311	1035	1038	201103	201103	201104	201105	1039	201106	1040	1042	201107
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1

Existing AM

I-495 OL

		Exit 28										Exit 29				Exit 30									Exit 31									
		MD 650										MD 193				US 29									MD 97									
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	9	7	8	8	7	9	9	14	14	13	12	10	15	16	15	14	14	11	19	20	20	19	16	15	14	19	16	30	35	33	41	50	51	53
Density	132	141	139	137	145	131	140	108	106	94	123	132	104	101	104	93	108	124	93	89	88	90	87	112	103	97	105	69	60	64	50	42	33	31
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	D	D
Volume	5852	6212	5722	5709	6114	6119	6058	6079	5997	5980	5654	6405	6354	6409	6340	6479	6162	7006	6994	7005	6995	6976	6986	6538	7458	7401	8248	8232	8324	8332	8332	8329	6639	6616
Lanes	5	6	5	5	6	5	5	4	4	5	4	5	4	4	4	5	4	5	4	4	4	4	5	4	5	4	5	4	4	4	4	4	4	4
Length	509	450	501	284	347	1136	1629	1881	1185	301	793	713	805	1020	517	277	854	787	704	2000	832	1091	449	621	594	336	957	536	2000	2000	1795	1336	311	1657
LinkID	1043	7404	2000824	1046	7405	7409	1044	7407	1047	2000762	2000759	2000753	2000752	1049	1050	495302	495303	495304	495305	1051	1051	1053	7024	7026	7028	7029	7031	495316	1055	1055	1055	1056	1970012	495339
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	3	1	1	1

	Exit 33									Exit 34		Exit 35					Exit 36														Exit 39			
	MD 185									MD 355		I-270					MD 187							I-270 W Spur							MD 190			
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	53	53	52	51	49	49	52	52	53	53	53	49	53	53	53	52	53	53	53	52	53	53	53	51	36	34	45	51	52	53	51	35	31	30
Density	27	34	30	39	41	40	38	38	30	33	25	23	28	28	28	21	24	22	22	29	29	29	29	30	46	59	44	39	37	31	34	51	58	56
LOS	D	D	D	E	E	E	E	E	D	D	C	C	D	D	D	C	C	C	C	D	D	D	D	D	F	F	E	E	E	D	D	F	F	F
Volume	7177	7138	7868	7824	7865	7861	7868	7865	7844	6912	3955	4385	4393	4395	4382	4378	3857	3430	4627	4615	4607	4585	4594	4574	9935	9911	9895	9887	9719	9880	8527	7303	7207	8298
Lanes	5	4	5	4	4	4	4	4	5	4	3	4	3	3	3	4	3	3	4	3	3	3	3	3	6	5	5	5	5	6	5	4	4	5
Length	752	746	998	526	1257	2000	87	1045	402	1593	288	910	494	913	1192	325	2000	22	406	1085	2000	2000	2000	1657	551	935	2000	659	446	1032	1585	2000	663	1788
LinkID	1953310	1953311	1953312	1953313	1058	1247	1247	1059	1248	1249	1251	1273	1276	1060	1061	1272	1275	1275	1274	495373	1063	1063	1063	1063	495375	495392	1064	1064	1066	495408	495407	495406	495406	495401
SegmentID	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	3	4	1	1	1	2	1	1	1	1	2	1

					Exit 41	Bridge		Exit 43				Exit 44		
					Clara Barton Pkwy	American Legion		GW Memorial Pkwy				VA 193		
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	46	51	52	52	50	52	52	52	53	53	52	52	52	43
Density	45	40	39	32	41	34	31	31	31	31	27	34	28	43
LOS	E	E	E	D	E	D	D	D	D	D	D	D	D	E
Volume	8269	8306	8159	8279	8117	8808	6531	6527	6517	6501	6968	7049	7301	7313
Lanes	4	4	4	5	4	5	4	4	4	4	5	4	5	4
Length	2000	1149	521	922	1713	1560	274	2000	2000	1223	735	1053	1414	613
LinkID	495415	495415	1067	495416	495417	495418	11230	1069	1069	1069	1083	1084	1101	1114
SegmentID	1	2	1	1	1	1	1	1	2	3	1	1	1	1

Existing AM - I-495 IL Link Evaluation Results

Existing AM
I-495 IL

				Exit 44 VA 193				Exit 43 GW Memorial Pkwy			Bridge American Legion		Exit 41 Clara Barton Pkwy								Exit 39 MD 190							I-270 W Spur						Exit 36 MD 187
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	58	57	50	31	23	18	15	21	20	24	45	52	55	57	56	56	56	56	57	57	57	57	57	55	57	57	54	58	57	57	56	39	56
Density	22	22	22	28	43	58	73	94	82	83	68	42	36	28	27	35	34	34	28	30	25	25	23	27	29	23	23	27	25	26	26	26	28	23
LOS	C	C	C	D	E	F	F	F	F	F	F	E	E	D	D	D	D	D	D	D	C	C	C	D	D	C	C	D	C	C	C	D	D	C
Volume	7607	7603	7604	7067	6745	7975	7793	6920	6830	6801	8297	7577	7610	7758	7770	7724	7728	7707	7684	6864	7140	7104	7923	7766	7894	7913	7922	4387	4389	4394	4404	4422	4424	3806
Lanes	6	6	6	5	5	6	6	5	4	4	5	4	4	5	5	4	4	4	5	4	5	5	6	5	5	6	6	3	3	3	3	3	4	3
Length	2000	192	1499	2000	95	1500	1537	645	687	494	1975	500	706	1511	777	2000	1461	1064	400	1947	1495	621	1123	398	1764	732	1509	2000	2000	2000	1671	1173	305	2000
LinkID	1100	1100	1037	495411	495411	1089	1054	1080	1079	1113	1073	495412	1062	495413	1057	495414	495414	1115	495402	495403	495404	1116	495405	495409	1117	495391	1118	495371	495371	495371	495371	1119	1263	1270
SegmentID	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	30	40	50	70	

						Exit 34 MD 355										Exit 33 MD 185										Exit 31 MD 97								
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	57	57	51	50	59	60	59	60	56	53	56	58	49	54	54	59	59	59	59	52	58	60	60	60	53	55	57	59	59	59	59	59	59
Density	20	18	24	27	36	28	21	26	26	27	36	34	26	31	29	24	27	25	31	31	35	32	24	24	26	27	31	25	30	31	30	30	30	30
LOS	C	C	C	D	E	D	C	C	C	D	E	D	D	D	D	C	D	C	D	D	D	D	C	C	C	D	D	C	D	D	D	D	D	D
Volume	3508	4152	4157	4161	3639	6504	7637	7662	7663	7644	7627	7649	7648	7616	6330	6471	6453	7286	7294	7238	7287	7286	7294	7299	6181	7025	6726	7173	7089	7176	7166	7156	7039	6992
Lanes	3	4	3	3	2	4	6	5	5	5	4	4	5	5	4	5	4	5	4	4	4	4	5	5	4	5	4	5	4	4	4	4	4	4
Length	21	439	659	1113	1519	1951	513	1013	1002	521	1603	252	526	658	913	228	793	1635	2000	164	2000	1786	2000	50	837	411	323	1131	452	2000	1086	1248	248	500
LinkID	1270	1271	1257	1121	1258	1250	1260	1261	1120	1262	495331	1122	495332	2000004	495333	495334	495335	495336	495317	495317	2000003	2000003	7015	7015	7017	7019	7021	7023	1953113	1124	1124	1125	1990014	495307
SegmentID	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	1	1	1	1	1	2	1	1	1

	Exit 30 US 29					Exit 29 MD 193										Exit 28 MD 650							Exit 27 I-95						Exit 25 US 1					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	56	60	61	60	60	56	56	45	54	58	59	61	60	61	60	39	51	58	58	60	61	62	60	60	60	62	57	56	42	27	38	41	42	38
Density	25	26	26	23	25	24	30	32	33	31	30	29	24	28	28	38	34	30	28	27	20	20	18	22	23	21	23	30	40	59	53	49	47	42
LOS	C	C	C	C	C	C	D	D	D	D	D	D	C	D	D	E	D	D	D	D	C	C	C	C	C	C	C	D	E	F	F	F	F	E
Volume	7020	6239	6257	6784	6129	6768	6802	7195	7209	7193	7182	7154	7131	6773	6712	7467	6940	6952	8114	8076	5002	5023	5428	5429	5384	3840	6670	6692	6686	8075	8024	8036	7940	8010
Lanes	5	4	4	5	4	5	4	5	4	4	4	4	5	4	4	5	4	4	5	5	4	4	5	4	4	3	5	4	4	5	4	4	4	5
Length	260	499	524	1562	808	422	768	284	1222	2000	1072	1153	356	352	505	464	500	1046	1496	1493	1028	536	347	2000	140	1527	1473	2000	1605	670	846	626	481	1017
LinkID	495308	495309	1127	495295	2100087	2000197	2000764	2000770	2000771	1129	1129	1130	7410	2201100	1131	7412	101100	1132	101111	1128	101104	1138	101106	101107	101107	1137	101110	102301	102301	102312	102313	1135	1136	102314
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1

	Exit 24 Greenbelt Metro Station					Exit 23 MD 201							Exit 22 MD 295												Exit 20 MD 450					Exit 19 US 50				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	46	49	52	50	54	53	52	49	50	53	55	54	53	54	55	55	55	55	55	54	54	53	53	55	46	50	56	55	54	57	57	56	55	54
Density	41	38	36	30	29	25	31	28	34	26	26	26	25	29	28	23	28	28	28	29	29	29	23	26	29	33	24	25	21	21	21	23	28	35
LOS	E	E	E	D	D	C	D	D	D	C	D	D	C	D	D	C	D	D	D	D	D	D	C	C	D	D	C	C	C	C	C	C	D	E
Volume	7544	7536	7507	7519	6150	6533	6498	6876	6849	6865	5717	5716	6698	6170	6140	6217	6197	6219	6221	6222	6239	6239	6101	5585	6677	6660	6649	5508	5527	4816	4835	7601	7618	7625
Lanes	4	4	4	5	4	5	4	5	4	5	4	4	5	4	4	5	4	4	4	4	4	4	5	4	5	4	5	4	5	4	4	6	5	4
Length	2000	1603	1046	440	1150	761	810	740	938	452	520	566	554	497	516	779	711	2000	2000	2000	1629	1217	263	1109	984	561	1359	1371	213	2000	616	1434	754	2000
LinkID	103501	103501	1139	103502	104704	104706	104707	104709	104710	104711	105902	1140	105904	105906	1141	105908	105909	1142	1142	1142	1142	1143	105910	106105	106108	106109	106110	107301	107302	107307	107307	107309	1144	107311
SegmentID	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	1	1	1	1	1	1	2	1	1	1

Existing AM

I-495 IL

	Exit 17						Exit 16					Exit 15						Exit 13										Exit 11					
	MD 202						Arena Dr					MD 214						Ritchie Marlboro Rd										MD 4					
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	55	55	55	55	55	54	56	57	56	57	53	56	57	57	55	57	57	56	58	58	55	56	56	53	47	39	53	58	53	55	57	58	58	59
Density	35	28	28	34	35	35	31	26	26	26	31	24	26	26	33	32	32	26	27	27	27	33	33	35	39	47	28	26	25	27	26	22	28	27
LOS	D	D	D	D	D	E	D	C	D	C	D	C	D	C	D	D	D	D	D	D	D	D	D	D	E	F	D	C	C	D	D	C	D	D
Volume	7593	7620	7648	5684	5691	5680	7067	7347	7356	7351	6669	6679	6077	7279	7285	7289	7212	7299	6335	6325	7390	7354	7362	7366	7352	7323	5910	5900	6722	5969	5993	6453	6445	6446
Lanes	4	5	5	3	3	3	4	5	5	5	4	5	4	5	4	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4
Length	190	855	1495	2000	2000	1908	1069	1470	249	1490	1056	692	986	1397	2000	796	480	997	2000	1072	1492	2000	2000	2000	772	1366	456	484	565	511	527	1147	344	1293
LinkID	107311	107312	1145	108500	108500	108500	109704	109707	1146	1148	110904	110905	110907	110913	1147	1147	1149	110915	111105	111105	111111	111112	111112	111112	111112	1150	112301	1151	112303	112305	1152	112307	112308	1153
SegmentID	2	1	1	1	2	3	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	2	3	4	1	1	1	1	1	1	1	1	1

				Exit 9									Exit 7													Exit 4								
				MD 337									MD 5													MD 414								
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	59	59	63	63	63	63	61	59	60	62	55	63	62	63	63	63	63	63	63	63	63	63	48	30	21	12	13	13	12	18	17	12	9	6
Density	27	22	23	23	23	19	25	26	25	20	22	15	16	20	17	21	21	21	21	22	22	22	23	42	59	91	95	92	89	76	79	106	98	148
LOS	D	C	C	C	C	C	C	C	C	C	C	B	B	C	B	C	C	C	C	C	C	C	C	E	F	F	F	F	F	F	F	F	F	F
Volume	6422	6423	5838	5881	5864	6075	6040	6073	6058	6083	6097	3835	4876	4887	5265	5315	5360	5391	5427	5438	5445	5423	5422	5022	4934	5272	4865	4861	5375	5420	5356	2489	2514	1725
Lanes	4	5	4	4	4	5	4	4	4	5	5	4	5	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4	5	4	4	2	3	2
Length	896	625	2000	2000	770	663	823	2000	727	761	1487	1134	789	706	691	807	2000	2000	2000	2000	670	860	617	1155	507	909	508	589	349	2000	55	1054	1707	1386
LinkID	1154	112309	113503	113503	113503	114701	114702	1155	1155	114703	1157	115905	115910	115911	115913	115914	1158	1158	1158	1158	1158	1159	115915	116102	1161	116104	116106	1162	116108	116109	116109	116110	116111	117305
SegmentID	1	1	1	2	3	1	1	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	1	2	1	1	1

	Exit 3						Exit 2							
	MD 210						I-295							WWB
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	6	8	9	12	14	16	18	45	57	58	58	56	47	57
Density	130	128	101	97	88	100	87	51	34	33	33	34	42	35
LOS	F	F	F	F	F	F	F	F	D	D	D	D	E	E
Volume	3079	3047	3654	3647	3632	3101	4643	4596	5755	5761	5766	5740	9954	9972
Lanes	4	3	4	3	3	2	3	2	3	3	3	3	5	5
Length	907	581	640	2000	598	1132	851	1030	2000	2000	2000	1329	2000	1262
LinkID	117307	117308	117310	117311	117311	118503	118504	118506	118508	118508	118508	118508	44	44
SegmentID	1	1	1	1	2	1	1	1	1	2	3	4	1	2

Existing AM - I-270 NB Link Evaluation Results

Existing AM I-270 NB		I-270 W Spur/I-495				Exit 1 Democracy Blvd		Westlake Terrace				I-270 Spur						Exit 4 Montrose Rd				Exit 5 MD 189					Exit 6 MD 28							Exit 8 Shady Grove Rd
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	57	57	63	64	64	63	63	63	63	63	63	63	63	63	63	64	64	64	61	62	64	64	63	64	64	62	62	63	64	64	64	64	64	64
Density	23	20	19	14	17	13	17	14	18	14	19	18	16	16	16	13	13	13	14	13	13	13	13	11	11	11	14	11	11	11	9	9	9	9
LOS	C	C	C	B	B	B	B	B	C	B	C	C	B	B	B	B	B	B	B	B	B	B	B	A	A	B	B	A	A	A	A	A	A	A
Volume	7922	3494	3489	3474	3302	3407	3279	3561	3482	3590	3586	5702	6161	6148	6148	3426	3421	3429	3431	3250	3249	3255	3241	2739	2738	3563	3558	2757	2758	2749	3026	3023	3016	2347
Lanes	6	3	3	4	3	4	3	4	3	4	3	5	6	6	6	4	4	4	4	4	4	4	4	4	4	5	4	4	4	4	5	5	5	4
Length	1509	2000	1447	894	790	887	457	820	1170	717	1862	447	1521	1210	1533	2000	955	425	1487	2000	1344	1921	1536	1407	531	640	1405	464	2000	1696	1482	1475	1523	2000
LinkID	1118	495372	495372	232	234	235	237	134	241	242	243	274	275	738	739	280	280	428	742	289	289	251	743	300	744	304	305	316	745	745	320	741	747	327
SegmentID	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1

🟥 🟧 🟨 🟩 🟩 **Speed Color Scale (mph)**

10 30 40 50 70

				Exit 9 I-370						Exit 10 MD 117		Exit 11 MD 124			Watkins Mill Rd								Exit 13 Middlebrook Rd				Exit 15 MD 118						Exit 16 MD 27	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	64	63	64	64	64	63	59	62	63	64	64	64	64	62	62	63	63	63	63	63	63	63	63	64	63	63	63	63	64	63	63	64	63	64
Density	9	8	10	10	10	10	11	13	13	12	12	12	12	12	15	14	14	14	14	14	12	13	11	12	12	9	11	12	12	11	11	11	9	12
LOS	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	A	B	B	A	B	B	B	A	B	B	A	B
Volume	2340	2547	2544	2538	2555	2556	4001	4021	4017	2973	2976	2977	2978	3638	3633	3642	3649	3654	3661	3643	3652	3342	3384	2984	2981	2963	2804	2310	2311	2689	2127	2135	2295	2275
Lanes	4	5	4	4	4	4	6	5	5	4	4	4	4	5	4	4	4	4	4	4	5	4	5	4	4	5	4	3	3	4	3	3	4	3
Length	1947	337	1171	633	2000	1616	531	843	1357	2000	2000	2000	1479	584	908	2000	2000	2000	402	725	763	636	672	874	1017	479	1561	1090	527	1717	520	1157	771	687
LinkID	327	335	339	749	411	411	347	348	754	350	350	350	350	362	363	762	762	762	762	763	364	365	367	369	764	370	372	374	765	376	378	766	380	381
SegmentID	2	1	1	1	1	2	1	1	1	1	2	3	4	1	1	1	2	3	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

											Exit 18 MD 121																Exit 22 MD 109							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	63	63	64	64	64	64	64	63	63	64	61	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	62	63	62	63	63	63	63	63
Density	9	13	13	13	13	13	13	13	9	10	9	9	11	12	17	17	17	17	17	17	17	17	17	17	17	17	12	16	11	17	17	17	17	17
LOS	A	B	B	B	B	B	B	B	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Volume	2386	2403	2411	2410	2410	2398	2394	2384	2383	1850	2174	2181	2172	2190	2189	2192	2190	2195	2184	2170	2191	2176	2172	2160	2165	2157	2159	2054	2125	2118	2118	2112	2103	2100
Lanes	4	3	3	3	3	3	3	3	4	3	4	4	3	3	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2
Length	457	1044	2000	2000	2000	2000	718	756	736	920	211	877	400	1727	2000	1731	2000	2000	905	482	2000	383	1176	2000	1202	1164	340	1049	291	1204	2000	2000	2000	2000
LinkID	383	384	767	767	767	767	767	768	385	387	389	1001	390	769	391	391	272	272	272	392	394	394	395	396	396	750	397	399	401	402	771	771	771	771
SegmentID	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	2	1	2	3	1	1	2	1	1	2	1	1	1	1	1	1	2	3	4

							Exit 26 MD 80																				Exit 31 MD 85				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	63	63	63	62	62	62	59	63	60	62	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63	62	62	58	63	61	63
Density	17	17	17	17	17	17	12	15	14	20	20	19	19	19	19	19	19	19	19	19	19	19	19	19	19	13	18	13	14	11	11
LOS	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B	B	B	B	B	A
Volume	2095	2095	2095	2097	2091	2081	2048	1866	2456	2445	2451	2448	2450	2449	2438	2420	2423	2399	2436	2434	2426	2422	2422	2412	2402	2417	2228	2191	1811	2730	2729
Lanes	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	4	4
Length	1502	2000	1497	2000	698	1279	214	773	615	868	2000	2000	2000	2000	1813	539	1225	391	2000	2000	2000	2000	2000	178	1025	473	1416	241	945	1115	392
LinkID	771	412	412	446	446	783	403	405	407	408	784	784	784	784	784	1010	1017	1007	869	869	869	869	869	869	785	415	417	421	423	425	577
SegmentID	5	1	2	1	2	1	1	1	1	1	1	2	3	4	5	1	1	1	1	2	3	4	5	6	1	1	1	1	1	1	1

Existing AM - I-270 SB Link Evaluation Results

Existing AM
I-270 SB

					Exit 31																			Exit 26										
					MD 85																			MD 80										
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	54	57	56	58	58	57	58	53	53	56	56	56	55	55	50	44	36	29	24	19	18	18	17	15	14	13	24	25	26	25	25	25	25	25
Density	29	27	28	28	28	19	23	21	31	30	30	30	30	30	33	38	46	55	65	81	87	87	89	71	101	93	74	71	69	72	71	69	72	72
LOS	D	D	D	D	D	C	C	C	D	D	D	D	D	D	D	E	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	4689	4661	4678	3194	3195	3178	2703	3326	3312	3337	3330	3333	3328	3330	3283	3293	3258	3189	3154	3125	3134	3138	3117	3121	2840	3534	3545	3561	3529	3548	3562	3497	3548	3561
Lanes	3	3	3	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2
Length	931	404	446	474	1052	294	849	378	1140	2000	2000	2000	2000	2000	262	2000	2000	2000	2000	2000	2000	548	1261	228	654	401	1114	1849	565	2000	2000	57	2000	2000
LinkID	683	2000012	157	2000014	699	2000016	2000017	2000020	2000021	703	703	703	703	703	703	448	448	448	448	448	448	448	704	201	2000022	2000025	2000026	705	447	455	455	455	453	453
SegmentID	1	1	1	1	1	1	1	1	1	1	2	3	4	5	6	1	2	3	4	5	6	7	1	1	1	1	1	1	1	1	2	3	1	2

🟥	🟧	🟨	🟩	🟩	Speed Color Scale (mph)
10	30	40	50	70	

					Exit 22																			Exit 18										
					MD 109																			MD 121										
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	25	25	25	24	23	23	19	37	46	45	46	47	47	46	47	47	47	46	46	52	53	52	52	51	52	53	53	53	45	27	22	21	17	12
Density	72	72	72	74	51	76	70	53	43	44	43	42	43	43	43	43	42	43	44	26	25	19	24	23	30	23	30	30	36	59	70	75	68	107
LOS	F	F	F	F	F	F	F	F	E	E	E	E	E	E	E	E	E	E	E	C	C	C	C	C	D	C	D	D	E	F	F	F	F	F
Volume	3561	3549	3554	3547	3535	3503	3973	3975	3983	3957	3933	3963	3973	3955	3993	4000	3982	3999	4002	4007	3997	3987	3744	4692	4693	4798	4804	4818	4812	4745	4708	4672	4675	3695
Lanes	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4	3	4	3	4	3	3	3	3	3	3	4	3
Length	2000	1801	1775	948	546	716	364	1119	2000	717	487	2000	475	658	2000	2000	856	2000	1724	624	766	708	839	828	553	1076	2000	2000	2000	2000	214	890	618	1871
LinkID	453	453	410	706	2000027	2000029	2000031	2000032	707	707	2000033	2000034	2000034	2000036	2000037	2000037	2000037	260	260	2000038	708	2000039	2000041	1002	2000044	709	2020578	2020578	2020578	2020578	2020578	710	2000045	2000047
SegmentID	3	4	1	1	1	1	1	1	1	2	1	1	2	1	1	2	3	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1

	Exit 16					Exit 15				Exit 13										Exit 11			Exit 10						Exit 9				Exit 8	
	MD 27					MD 118				Middlebrook Rd							Watkins Mill Rd			MD 124			MD 117						I-370				Shady Grove Rd	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	9	12	11	11	13	13	15	15	24	27	27	26	26	23	24	23	19	17	16	14	20	22	25	25	26	31	32	27	23	11	12	12	25	30
Density	124	120	117	109	121	96	112	93	75	67	67	69	69	77	73	77	77	82	99	106	91	85	75	75	70	58	49	63	61	110	102	99	60	50
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	4480	4458	4946	4964	4604	4969	4920	5494	5470	5484	5479	7182	7192	7115	7131	7053	7138	7138	6149	7528	7461	7523	7538	9279	9310	9168	9312	6964	6964	4795	4829	6026	6040	6084
Lanes	4	3	4	4	3	4	3	4	3	3	3	4	4	4	4	4	5	5	4	5	4	4	4	5	5	5	6	4	5	4	4	5	4	4
Length	684	1035	1007	1058	1713	543	751	500	1025	2000	723	1566	1324	2000	2000	527	1491	1471	1167	838	658	2000	1062	1569	1151	431	1058	1258	1263	2000	1427	1046	420	497
LinkID	2000049	2000050	2000052	711	2000054	2000056	2000057	2000059	2000060	712	712	2000062	713	1026	1026	1026	2000063	718	2000064	2000067	2000068	720	720	2000070	2000097	721	2000071	2000072	2000074	2000075	2000075	2000081	2000082	723
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	3	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1

						Exit 6						Exit 5					Exit 4											Exit 1						
						MD 28						MD 189					Montrose Rd						I-270 Spur				Westlake Terrace	Democracy Blvd						I-270 W Spur/I-495
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	30	21	17	15	20	20	18	29	33	21	18	18	18	18	16	23	22	21	21	22	30	36	33	29	19	17	23	30	30	30	32	39	41	36
Density	51	59	73	78	72	72	72	57	50	65	76	77	77	77	84	71	75	76	78	76	56	47	44	56	94	103	60	55	56	37	42	46	44	46
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	F	F	F	F	F	F	E	E	F	E	F
Volume	6131	4977	5116	5689	5737	5743	6572	6586	6618	5521	5529	5533	5504	5481	6560	6556	6575	6537	6546	10064	10131	10086	10153	9909	5263	5259	5428	5029	4994	5445	5403	5413	5390	9935
Lanes	4	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4	4	4	6	6	6	7	6	3	3	4	3	3	5	4	3	3	6
Length	1518	2000	1645	473	1022	1591	655	921	1515	2000	1237	1874	2000	1407	598	882	303	2000	1022	2000	1707	722	400	371	2000	1000	963	2000	461	522	937	2000	520	551
LinkID	724	2000093	2000093	2000098	2000099	725	2000115	2000120	727	2000124	2000124	159	194	194	2000134	2000135	728	239	239	129	129	730	443	442	133	133	137	138	138	141	2020142	2115374	2115374	495375
SegmentID	1	1	2	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	2	1	2	1	1	1	1	2	1	1	2	1	1	1	2	1

Existing PM - I-495 OL Link Evaluation Results

Existing PM
I-495 OL

									Exit 2			Exit 3									Exit 4													
	WWB								I-295			MD 210									MD 414													
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	47	23	50	55	56	58	58	58	58	56	57	58	58	56	53	58	57	58	58	57	58	58	53	53	53	53	53	52	52	52	53	53	53
Density	31	39	76	35	32	31	32	21	25	26	26	26	29	27	26	35	32	25	28	28	24	26	26	25	31	31	31	31	32	32	32	25	25	25
LOS	D	E	F	E	D	D	D	C	C	C	D	D	D	D	C	D	D	C	D	D	C	D	D	C	D	D	D	D	D	D	D	C	C	C
Volume	9137	9127	5273	5287	5280	5277	3730	3736	2955	2953	4465	4478	3339	6352	7258	7271	7259	7215	6540	6553	6750	6079	6068	6581	6448	6623	6623	6620	6612	6610	6595	6558	5260	5248
Lanes	5	5	3	3	3	3	2	3	2	2	3	3	2	4	5	4	4	5	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4
Length	2000	2000	2000	2000	2000	195	1182	890	2000	1282	2000	1297	1256	824	1314	1054	1042	448	914	495	674	410	694	1037	428	2000	2000	2000	2000	1655	912	602	729	508
LinkID	1	1	218503	218503	218503	218503	218507	218508	218509	218509	318105	318105	217308	217315	217316	971	972	217318	216105	973	216107	216110	974	216112	216115	979	979	979	979	979	980	216114	215901	981
SegmentID	1	2	1	2	3	4	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1

Speed Color Scale (mph)

🟥	🟧	🟨	🟩	🟩
10	30	40	50	70

	Exit 7									Exit 9								Exit 11											Exit 13					
	MD 5									MD 337								MD 4											Ritchie Marlboro Rd					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	52	53	51	46	37	26	21	18	17	18	18	41	50	51	53	53	50	51	52	52	50	52	52	53	53	53	53	41	28	20	31	31	27
Density	23	27	27	26	36	45	63	78	84	89	86	79	44	36	36	31	31	29	33	32	29	38	37	37	37	37	36	29	45	65	80	59	59	64
LOS	C	D	D	D	E	E	F	F	F	F	F	F	E	E	E	D	D	D	D	D	D	E	E	E	E	E	E	D	E	F	F	F	F	F
Volume	5916	5641	5633	6739	6668	6696	6634	6596	6217	6191	6167	7239	7271	7216	7268	6514	6496	7343	6597	6589	7662	7645	7664	7664	7675	7677	7627	7672	7282	7201	7887	7272	7220	7064
Lanes	5	4	4	5	4	4	4	4	4	4	4	5	4	4	4	4	4	5	4	4	5	4	4	4	4	4	4	5	4	4	5	4	4	4
Length	1080	481	657	677	798	2000	773	1493	2000	2000	1594	706	788	515	1390	726	505	449	551	554	462	1023	2000	2000	2000	933	536	940	2000	518	1353	2000	1046	208
LinkID	215904	215905	982	215907	215908	983	983	984	214702	214702	214702	213501	213502	985	986	212301	992	212303	212305	1003	212307	212308	1004	1004	1004	1004	1005	212309	211206	211206	211212	1006	1006	1020
SegmentID	1	1	1	1	1	1	2	1	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	2	1	1	2	1

			Exit 15					Exit 16		Exit 17										Exit 19							Exit 20							
			MD 214					Arena Dr		MD 202										US 50							MD 450							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	19	12	12	15	13	16	19	18	14	14	14	10	15	17	24	42	48	53	57	58	58	58	58	58	53	55	57	58	57	56	57	48	29	23
Density	77	121	107	112	106	88	89	77	117	118	117	121	98	85	77	43	38	28	24	19	21	21	21	20	27	28	22	26	23	30	30	35	57	70
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	E	D	C	C	C	C	C	C	D	D	C	C	C	D	D	D	F	F
Volume	7237	5825	6615	6619	7022	7077	6731	6813	4791	4783	4767	7286	7236	7284	7282	7285	7277	7274	5604	5600	4971	4965	4937	7047	7184	6251	6173	5926	6694	6641	6693	6689	6606	6490
Lanes	5	4	5	4	5	5	4	5	3	3	3	6	5	5	4	4	4	5	4	5	4	4	4	6	5	4	5	4	5	4	4	4	4	4
Length	1288	1160	803	743	1378	1328	648	1500	2000	2000	1020	1002	499	722	2000	1520	793	705	785	562	2000	276	520	571	1391	716	276	949	1042	455	2000	2000	2000	1837
LinkID	211214	210903	210905	210906	210909	1022	209703	209704	209710	209710	209710	208515	208516	1023	326	326	1024	208518	207302	207303	207305	207305	1025	207306	207307	206101	206102	206104	206108	206109	1027	1027	1027	1027
SegmentID	1	1	1	1	1	1	1	1	1	2	3	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	3	4

					Exit 22						Exit 23					Exit 24						Exit 25						Exit 27						
					MD 295						MD 201					Greenbelt Metro Station						US 1						I-95						
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	22	16	13	13	12	17	18	14	15	16	14	21	19	23	24	29	23	29	50	55	57	57	57	58	56	58	59	58	58	58	53	53	53	53
Density	74	77	98	100	109	94	89	97	103	97	105	85	78	82	77	63	66	66	39	32	31	28	25	24	25	19	19	15	19	19	23	23	23	25
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	D	D	D	C	C	C	C	C	B	C	C	C	C	C	C
Volume	6410	6341	5267	5240	6502	6385	6396	6976	6262	6299	7086	7134	7425	7388	7414	7417	7760	7779	7774	7047	7016	7811	8456	8445	8446	4398	4352	4405	4433	4421	7279	7297	7284	6608
Lanes	4	5	4	4	5	4	4	5	4	4	5	4	5	4	4	4	5	4	4	4	4	5	6	6	6	4	4	5	4	4	6	6	6	5
Length	903	595	570	541	439	501	699	1815	589	828	434	995	471	993	2000	1085	1301	1225	1250	244	973	1149	1517	673	1486	2000	355	1017	490	825	1506	839	1513	814
LinkID	1029	206110	205903	1030	205905	205907	1031	205909	204704	1032	204706	204707	204709	204710	1033	1033	203501	1034	1036	20020	202306	202308	202311	1035	1038	201103	201103	201104	201105	1039	201106	1040	1042	201107
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1

Existing PM

I-495 OL

	Exit 28										Exit 29				Exit 30									Exit 31									
		MD 650										MD 193				US 29									MD 97									
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	53	51	53	53	52	53	51	51	52	53	53	53	52	53	53	53	52	47	46	51	53	53	53	53	52	52	52	49	50	50	52	53	53	53
Density	25	23	24	24	22	27	27	35	33	26	29	26	32	32	32	27	32	32	40	36	36	35	28	30	28	35	29	39	38	38	37	36	31	31
LOS	C	C	C	C	C	D	D	D	D	D	D	C	D	D	D	D	D	D	E	E	E	E	D	D	D	D	D	E	E	E	E	E	D	D
Volume	6570	7097	6362	6356	6963	6984	6980	6985	6960	6984	6148	6791	6741	6792	6762	7000	6642	7470	7453	7474	7465	7429	7457	6273	7223	7155	7655	7639	7693	7692	7683	7674	6522	6502
Lanes	5	6	5	5	6	5	5	4	4	5	4	5	4	4	4	5	4	5	4	4	4	4	5	4	5	4	5	4	4	4	4	4	4	4
Length	509	450	501	284	347	1136	1629	1881	1185	301	793	713	805	1020	517	277	854	787	704	2000	832	1091	449	719	500	336	957	536	2000	2000	1795	1336	311	1657
LinkID	1043	7404	2000824	1046	7405	7409	1044	7407	1047	2000762	2000759	2000753	2000752	1049	1050	495302	495303	495304	495305	1051	1051	1053	7024	7026	7028	7029	7031	495316	1055	1055	1055	1056	1970012	495339
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	3	1	1	1

	Exit 33									Exit 34		Exit 35					Exit 36														Exit 39			
	MD 185									MD 355		I-270					MD 187							I-270 W Spur							MD 190			
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	52	53	51	47	47	51	52	53	53	53	49	53	53	53	53	53	53	53	53	53	53	42	15	15	16	16	18	18	18	16	15	15	18
Density	28	35	29	37	40	41	37	37	29	32	22	20	25	25	25	19	21	19	19	26	26	26	33	93	82	92	94	84	82	70	85	98	100	80
LOS	D	D	D	E	E	E	E	E	D	D	C	C	C	C	C	C	C	C	C	C	C	C	D	F	F	F	F	F	F	F	F	F	F	F
Volume	7250	7225	7658	7616	7647	7642	7658	7651	7642	6693	3499	3940	3944	3944	3942	3940	3436	3067	4092	4083	4096	4099	4093	4053	7434	7466	7402	7427	7331	7436	6581	5947	5902	7014
Lanes	5	4	5	4	4	4	4	4	5	4	3	4	3	3	3	4	3	3	4	3	3	3	3	3	6	5	5	5	5	6	5	4	4	5
Length	752	746	998	526	1257	2000	87	1045	402	1593	288	910	494	913	1192	325	2000	22	406	1085	2000	2000	2000	1657	554	938	2000	659	446	1032	1585	2000	663	1788
LinkID	1953310	1953311	1953312	1953313	1058	1247	1247	1059	1248	1249	1251	1273	1276	1060	1061	1272	1275	1275	1274	495373	1063	1063	1063	1063	495375	495392	1064	1064	1066	495408	495407	495406	495406	495401
SegmentID	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	3	4	1	1	1	2	1	1	1	1	2	1

					Exit 41	Bridge		Exit 43				Exit 44		
					Clara Barton Pkwy	American Legion		GW Memorial Pkwy				VA 193		
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	29	28	27	29	41	48	42	34	17	13	12	18	18	20
Density	61	64	64	49	43	35	34	42	82	106	105	88	77	88
LOS	F	F	F	F	E	D	D	E	F	F	F	F	F	F
Volume	7010	7041	6906	7011	7008	8290	5724	5673	5560	5523	6432	6448	6984	6998
Lanes	4	4	4	5	4	5	4	4	4	4	5	4	5	4
Length	2000	1149	521	922	1713	1524	320	2000	2000	1213	735	1053	1414	613
LinkID	495415	495415	1067	495416	495417	495418	11138	1069	1069	1069	1083	1084	1101	1114
SegmentID	1	2	1	1	1	1	1	1	2	3	1	1	1	1

Existing PM - I-495 IL Link Evaluation Results

Existing PM

I-495 IL

				Exit 44				Exit 43			Bridge		Exit 41								Exit 39													Exit 36
				VA 193				GW Memorial Pkwy			American Legion		Clara Barton Pkwy								MD 190							I-270 W Spur						MD 187
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	23	14	14	10	8	7	8	10	17	19	17	16	16	12	13	17	16	16	15	13	15	14	19	21	24	40	41	52	55	54	54	53	38	22
Density	43	67	67	107	119	143	132	130	90	81	93	109	109	119	105	101	109	110	92	119	105	106	77	81	74	37	36	25	24	24	24	24	25	52
LOS	E	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	E	C	C	C	C	C	C	F
Volume	5915	5774	5774	5358	5043	6347	6360	6219	6171	6211	8009	6877	6903	7005	6951	6929	6940	6948	6935	6322	7643	7582	8854	8642	8778	8790	8758	3891	3915	3915	3909	3910	3894	3404
Lanes	6	6	6	5	5	6	6	5	4	4	5	4	4	5	5	4	4	4	5	4	5	5	6	5	5	6	6	3	3	3	3	3	4	3
Length	435	1499	1499	2000	95	1500	1537	645	687	494	1975	500	706	1511	777	2000	1461	1064	400	1947	1495	621	1123	398	1764	732	1509	2000	2000	2000	1671	1173	305	2000
LinkID	1100	1037	1037	495411	495411	1089	1054	1080	1079	1113	1073	495412	1062	495413	1057	495414	495414	1115	495402	495403	495404	1116	495405	495409	1117	495391	1118	495371	495371	495371	495371	1119	1263	1270
SegmentID	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1

Speed Color Scale (mph)

🟥	🟧	🟨	🟩	🟩
10	30	40	50	70

						Exit 34										Exit 33										Exit 31								
						MD 355										MD 185										MD 97								
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	15	15	16	17	16	12	12	14	13	13	14	15	14	13	12	11	13	13	20	21	23	23	21	21	18	16	19	19	22	36	36	34	31	28
Density	69	59	76	70	100	115	91	97	102	102	107	103	88	92	113	105	111	110	88	87	79	78	68	69	89	93	95	82	87	53	52	55	60	65
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	3066	3594	3540	3457	3126	5712	6611	6702	6756	6700	6009	6012	6018	6031	5447	5716	5688	7214	7214	7161	7208	7179	7152	7139	6604	7315	7070	7611	7520	7568	7552	7532	7343	7266
Lanes	3	4	3	3	2	4	6	5	5	5	4	4	5	5	4	5	4	5	4	4	4	4	5	5	4	5	4	5	4	4	4	4	4	4
Length	21	439	659	1113	1519	1951	513	1013	1002	522	1603	252	526	658	913	228	793	1635	2000	164	2000	1786	2000	50	837	411	323	1131	452	2000	1086	1248	248	500
LinkID	1270	1271	1257	1121	1258	1250	1260	1261	1120	1262	495331	1122	495332	2000004	495333	495334	495335	495336	495317	495317	2000003	2000003	7015	7015	7017	7019	7021	7023	1953113	1124	1124	1125	1990014	495307
SegmentID	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	2	1	1	1	1	1	1	2	1	1	1

	Exit 30					Exit 29										Exit 28							Exit 27						Exit 25					
	US 29					MD 193										MD 650							I-95						US 1					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	25	19	17	14	16	15	19	18	24	28	38	46	45	42	37	27	29	40	53	53	53	53	52	53	52	39	19	15	15	18	29	39	46	48
Density	58	82	94	103	103	93	94	86	79	67	50	41	33	43	48	58	64	46	31	31	25	25	22	27	27	32	69	109	111	89	71	52	44	34
LOS	F	F	F	F	F	F	F	F	F	F	F	E	D	E	F	F	F	F	D	D	C	C	C	D	D	D	F	F	F	F	F	F	E	D
Volume	7273	6262	6254	7165	6555	7101	7155	7604	7647	7633	7629	7614	7608	7172	7129	7830	7456	7467	8282	8259	5271	5295	5648	5643	5596	3774	6659	6660	6683	8092	8088	8122	8027	8107
Lanes	5	4	4	5	4	5	4	5	4	4	4	4	5	4	4	5	4	4	5	5	4	4	5	4	4	3	5	4	4	5	4	4	4	5
Length	260	499	524	1562	808	422	768	284	1222	2000	1072	1153	356	352	505	464	500	1046	1496	1493	1028	536	347	2000	140	1527	1473	2000	1605	671	846	626	481	1017
LinkID	495308	495309	1127	495295	2100087	2000197	2000764	2000770	2000771	1129	1129	1130	7410	2201100	1131	7412	101100	1132	101111	1128	101104	1138	101106	101107	101107	1137	101110	102301	102301	102312	102313	1135	1136	102314
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1

	Exit 24					Exit 23							Exit 22													Exit 20					Exit 19				
	Greenbelt Metro Station					MD 201							MD 295													MD 450					US 50				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	48	48	48	51	51	50	46	34	41	50	51	50	48	46	48	48	39	36	33	33	31	28	25	23	26	33	20	13	13	13	13	16	22	33
Density	42	42	41	32	32	29	40	46	49	32	33	34	34	42	40	32	50	55	59	58	63	68	59	77	64	62	80	120	98	115	110	85	73	61
LOS	E	E	E	D	D	D	E	F	F	D	D	D	D	E	E	D	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	7987	7992	7957	7986	6594	7259	7234	7956	7950	7963	6821	6835	8235	7759	7723	7819	7777	7781	7724	7701	7665	7558	7383	7071	8211	8151	8120	6159	6206	5747	5754	7989	7981	7942
Lanes	4	4	4	5	4	5	4	5	4	5	4	4	5	4	4	5	4	4	4	4	4	4	5	4	5	4	5	4	5	4	4	6	5	4
Length	2000	1603	1046	440	1150	761	810	740	938	452	520	566	554	497	516	779	711	2000	2000	2000	1629	1217	263	1180	915	561	1359	1371	213	2000	616	1434	754	2000
LinkID	103501	103501	1139	103502	104704	104706	104707	104709	104710	104711	105902	1140	105904	105906	1141	105908	105909	1142	1142	1142	1142	1143	105910	106105	106108	106109	106110	107301	107302	107307	107307	107309	1144	107311
SegmentID	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	1	1	1	1	1	1	2	1	1	1

Existing PM

I-495 IL

	Exit 17						Exit 16					Exit 15							Exit 13										Exit 11					
	MD 202						Arena Dr					MD 214							Ritchie Marlboro Rd										MD 4					
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	32	29	24	20	20	20	29	49	49	48	46	50	50	45	48	49	49	52	52	52	51	51	51	49	50	48	51	52	50	51	52	51	51	52
Density	61	54	65	97	96	96	61	31	31	32	38	28	32	34	39	39	38	29	28	28	28	34	35	36	35	37	30	30	28	30	30	27	33	33
LOS	F	F	F	F	F	F	F	D	D	D	E	D	D	D	E	E	E	D	D	D	D	D	D	E	E	E	D	D	D	D	D	D	D	D
Volume	7874	7904	7928	5742	5775	5769	7140	7596	7606	7600	6987	6985	6411	7587	7589	7576	7479	7555	5890	5868	7050	7021	7058	7058	7040	7044	6250	6243	6954	6095	6115	6835	6818	6812
Lanes	4	5	5	3	3	3	4	5	5	5	4	5	4	5	4	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4
Length	190	855	1495	2000	2000	1908	1069	1470	249	1490	1056	692	986	1397	2000	796	480	997	2000	1072	1492	2000	2000	2000	772	1366	456	484	565	511	527	1147	344	1293
LinkID	107311	107312	1145	108500	108500	108500	109704	109707	1146	1148	110904	110905	110907	110913	1147	1147	1149	110915	111105	111105	111111	111112	111112	111112	111112	1150	112301	1151	112303	112305	1152	112307	112308	1153
SegmentID	2	1	1	1	2	3	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	2	3	4	1	1	1	1	1	1	1	1	1

				Exit 9									Exit 7													Exit 4								
				MD 337									MD 5													MD 414								
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	52	61	63	63	62	60	56	57	61	63	63	62	63	63	63	63	63	63	63	63	63	63	63	63	62	63	63	62	62	60	62	63	63
Density	33	26	26	25	25	23	29	31	31	23	22	17	18	22	18	23	23	23	23	23	23	23	18	21	21	19	20	20	18	22	22	28	18	21
LOS	D	D	C	C	C	C	D	D	D	C	C	B	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B	C	C	D	C	C
Volume	6793	6797	6327	6347	6320	6966	6941	6986	6960	6961	6953	4389	5424	5447	5683	5722	5742	5739	5728	5730	5730	5695	5681	5422	5375	5733	5040	5027	5458	5469	5368	3476	3491	2709
Lanes	4	5	4	4	4	5	4	4	4	5	5	4	5	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4	5	4	4	2	3	2
Length	896	625	2000	2000	770	663	823	2000	727	761	1487	1134	789	706	691	807	2000	2000	2000	2000	670	860	617	1155	507	909	508	589	349	2000	55	1054	1707	1386
LinkID	1154	112309	113503	113503	113503	114701	114702	1155	1155	114703	1157	115905	115910	115911	115913	115914	1158	1158	1158	1158	1158	1159	115915	116102	1161	116104	116106	1162	116108	116109	116109	116110	116111	117305
SegmentID	1	1	1	2	3	1	1	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	1	2	1	1	1

	Exit 3						Exit 2							
	MD 210						I-295							WWB
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	59	59	54	38	28	24	21	45	49	53	53	53	56	57
Density	14	19	18	34	44	68	77	49	44	41	40	40	31	31
LOS	B	C	B	D	E	F	F	F	E	E	E	E	D	D
Volume	3386	3361	3826	3791	3753	3333	4740	4403	6414	6423	6413	6360	8608	8624
Lanes	4	3	4	3	3	2	3	2	3	3	3	3	5	5
Length	907	581	640	2000	598	1132	851	1030	2000	2000	2000	1329	2000	1262
LinkID	117307	117308	117310	117311	117311	118503	118504	118506	118508	118508	118508	118508	44	44
SegmentID	1	1	1	1	2	1	1	1	1	2	3	4	1	2

Existing PM - I-270 NB Link Evaluation Results

Existing PM
I-270 NB

						Exit 1												Exit 4				Exit 5					Exit 6							Exit 8
		I-270 W Spur/I-495				Democracy Blvd		Westlake Terrace				I-270 Spur						Montrose Rd				MD 189					MD 28							Shady Grove Rd
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	41	37	36	27	22	14	22	23	30	30	36	34	47	52	52	51	52	53	37	49	53	53	52	52	53	49	50	53	52	52	53	53	51	35
Density	36	44	45	44	65	80	68	58	59	49	55	59	39	36	35	39	38	37	53	39	36	36	37	33	33	35	42	37	37	37	32	32	34	46
LOS	E	E	F	E	F	F	F	F	F	F	F	F	E	E	E	E	E	E	F	E	E	E	E	D	D	D	E	E	E	E	D	D	D	F
Volume	8758	4838	4833	4777	4290	4547	4496	5332	5299	5946	5953	9950	11016	11026	11029	7854	7843	7853	7868	7611	7595	7611	7612	6986	6986	8442	8443	7684	7690	7686	8510	8511	8501	6389
Lanes	6	3	3	4	3	4	3	4	3	4	3	5	6	6	6	4	4	4	4	4	4	4	4	4	4	5	4	4	4	4	5	5	5	4
Length	1509	2000	1447	894	790	887	457	820	1170	716	1849	447	1521	1210	1533	2000	955	425	1487	2000	1344	1921	1536	1407	531	640	1405	464	2000	1696	1482	1475	1523	2000
LinkID	1118	495372	495372	232	234	235	237	134	241	242	243	274	275	738	739	280	280	428	742	289	289	251	743	300	744	304	305	316	745	745	320	741	747	327
SegmentID	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1

Speed Color Scale (mph)

🟥		🟧	🟨	🟩	🟩
	10	30	40	50	70

				Exit 9						Exit 10		Exit 11											Exit 13				Exit 15						Exit 16	
				I-370						MD 117		MD 124			Watkins Mill Rd								Middlebrook Rd				MD 118						MD 27	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	22	14	18	18	19	19	16	20	21	19	20	20	20	19	37	40	36	35	33	32	25	20	17	21	25	34	35	39	47	48	48	48	48	47
Density	73	93	90	89	88	86	83	80	78	87	84	84	83	82	53	50	55	57	60	61	62	94	89	78	66	39	45	48	40	32	31	31	25	33
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	F	F	E	D	D	D	C	D
Volume	6324	6532	6540	6538	6562	6535	7987	8012	8015	6702	6722	6680	6633	7936	7934	7965	7940	7912	7901	7849	7873	7370	7460	6658	6657	6627	6306	5682	5680	6194	4432	4455	4730	4692
Lanes	4	5	4	4	4	4	6	5	5	4	4	4	4	5	4	4	4	4	4	4	5	4	5	4	4	5	4	3	3	4	3	3	4	3
Length	1947	337	1171	633	2000	1610	531	843	1357	2000	2000	2000	1479	584	908	2000	2000	2000	402	725	763	636	665	872	1017	479	1561	1090	527	1717	520	1157	771	687
LinkID	327	335	339	749	411	411	347	348	754	350	350	350	350	362	363	762	762	762	762	763	364	365	367	369	764	370	372	374	765	376	378	766	380	381
SegmentID	2	1	1	1	1	2	1	1	1	1	2	3	4	1	1	1	2	3	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

											Exit 18																Exit 22							
											MD 121																MD 109							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	47	46	47	45	41	36	33	32	29	24	22	20	23	31	45	49	50	50	50	50	50	50	50	50	52	52	53	53	52	51	52	52	52	52
Density	26	35	35	36	40	45	49	50	41	55	49	52	62	45	47	42	41	41	41	41	42	41	41	41	40	40	26	37	26	40	39	39	39	39
LOS	C	E	E	E	E	F	F	F	E	F	F	F	F	F	F	E	E	E	E	E	E	E	E	E	E	E	C	E	D	E	E	E	E	E
Volume	4876	4909	4927	4920	4904	4863	4840	4803	4784	3999	4253	4231	4180	4191	4171	4175	4168	4179	4170	4144	4179	4153	4154	4167	4178	4160	4162	3980	4108	4099	4112	4108	4110	4113
Lanes	4	3	3	3	3	3	3	3	4	3	4	4	3	3	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2
Length	457	1044	2000	2000	2000	2000	718	756	736	920	211	877	400	1727	2000	1731	2000	2000	905	482	2000	383	1176	2000	1202	1164	340	1049	291	1204	2000	2000	2000	2000
LinkID	383	384	767	767	767	767	767	768	385	387	389	1001	390	769	391	391	272	272	272	392	394	394	395	396	396	750	397	399	401	402	771	771	771	771
SegmentID	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	2	1	2	3	1	1	2	1	1	2	1	1	1	1	1	1	2	3	4

							Exit 26																				Exit 31				
							MD 80																				MD 85				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	52	52	52	52	51	51	52	47	46	51	52	52	52	52	52	52	52	52	52	52	52	52	52	52	53	53	52	53	53	53
Density	39	39	39	39	39	40	27	34	29	46	41	40	40	40	40	40	40	39	40	40	40	40	40	40	40	26	36	24	33	24	24
LOS	E	E	E	E	E	E	D	D	D	F	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	C	E	C	D	C	C
Volume	4108	4109	4105	4111	4108	4091	4041	3569	4187	4173	4184	4186	4180	4180	4179	4160	4168	4127	4185	4188	4185	4178	4170	4169	4146	4159	3847	3795	3524	5088	5091
Lanes	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	4	4
Length	1502	2000	1497	2000	698	1279	214	773	615	868	2000	2000	2000	2000	1813	539	1225	391	2000	2000	2000	2000	2000	178	1025	473	1416	241	945	1115	392
LinkID	771	412	412	446	446	783	403	405	407	408	784	784	784	784	784	1010	1017	1007	869	869	869	869	869	869	785	415	417	421	423	425	577
SegmentID	5	1	2	1	2	1	1	1	1	1	1	2	3	4	5	1	1	1	1	2	3	4	5	6	1	1	1	1	1	1	1

Existing PM - I-270 SB Link Evaluation Results

Existing PM
I-270 SB

					Exit 31																			**Exit 26**										
					MD 85																			**MD 80**										
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	58	58	59	58	56	59	55	59	62	63	63	63	63	63	63	62	61	61	60	59	58	57	55	60	59	57	58	58	59	59	58	58	58
Density	18	18	18	20	20	14	15	14	20	19	18	18	18	18	18	18	19	19	19	19	19	20	20	14	16	12	19	18	18	18	18	18	18	18
LOS	B	B	B	C	C	B	B	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B	B	B	C	C	C	B	C	B	C	C
Volume	3075	3062	3072	2317	2321	2305	1796	2338	2322	2328	2324	2332	2328	2324	2296	2322	2321	2313	2311	2301	2293	2293	2294	2295	1874	2122	2131	2125	2104	2112	2113	2068	2106	2117
Lanes	3	3	3	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2
Length	931	404	446	474	1052	294	849	378	1140	2000	2000	2000	2000	2000	262	2000	2000	2000	2000	2000	2000	548	1261	228	654	401	1114	1849	565	2000	2000	57	2000	2000
LinkID	683	2000012	157	2000014	699	2000016	2000017	2000020	2000021	703	703	703	703	703	703	448	448	448	448	448	448	448	704	201	2000022	2000025	2000026	705	447	455	455	455	453	453
SegmentID	1	1	1	1	1	1	1	1	1	1	2	3	4	5	6	1	2	3	4	5	6	7	1	1	1	1	1	1	1	1	2	3	1	2

🟥 🟧 🟨 🟩 🟩 **Speed Color Scale (mph)**

10 30 40 50 70

					Exit 22																			**Exit 18**										
					MD 109																			**MD 121**										
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	57	57	58	58	58	54	55	58	58	57	58	58	58	58	58	58	57	58	60	62	61	62	61	63	63	63	64	64	64	64	63	63	64
Density	18	18	18	18	12	17	14	20	19	19	19	19	19	19	19	19	19	19	19	12	12	9	11	10	13	10	14	13	13	13	13	13	10	12
LOS	C	C	C	C	B	B	B	C	C	C	C	C	C	C	C	C	C	C	C	B	B	A	A	A	B	A	B	B	B	B	B	B	A	B
Volume	2120	2117	2112	2111	2102	2039	2199	2201	2208	2198	2188	2212	2213	2197	2210	2211	2199	2210	2203	2202	2195	2190	1988	2371	2365	2577	2575	2565	2561	2561	2565	2547	2547	2203
Lanes	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4	3	4	3	4	3	3	3	3	3	3	4	3
Length	2000	1801	1775	948	546	716	364	1119	2000	717	487	2000	475	658	2000	2000	856	2000	1724	624	766	708	839	828	553	1076	2000	2000	2000	2000	214	890	618	1871
LinkID	453	453	410	706	2000027	2000029	2000031	2000032	707	707	2000033	2000034	2000034	2000036	2000037	2000037	2000037	260	260	2000038	708	2000039	2000041	1002	2000044	709	2020578	2020578	2020578	2020578	2020578	710	2000045	2000047
SegmentID	3	4	1	1	1	1	1	1	1	2	1	1	2	1	1	2	3	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1

	Exit 16					**Exit 15**				**Exit 13**										**Exit 11**			**Exit 10**						**Exit 9**				**Exit 8**	
	MD 27					**MD 118**				**Middlebrook Rd**							**Watkins Mill Rd**			**MD 124**			**MD 117**						**I-370**				**Shady Grove Rd**	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	62	63	63	63	63	62	63	62	62	63	63	63	63	64	63	63	64	63	64	60	62	62	62	61	61	61	62	63	64	64	64	60	59	60
Density	11	14	12	12	14	12	15	14	19	19	19	18	18	17	18	17	14	14	14	16	19	19	20	21	21	21	17	17	13	13	13	14	18	18
LOS	B	B	B	B	B	B	B	B	C	C	C	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	B	B	B	B	B	B	B	B
Volume	2751	2735	2975	2978	2632	2949	2921	3533	3534	3542	3540	4427	4437	4426	4430	4365	4424	4431	3574	4869	4829	4861	4864	6460	6477	6402	6467	4238	4232	3385	3383	4211	4216	4222
Lanes	4	3	4	4	3	4	3	4	3	3	3	4	4	4	4	4	5	5	4	5	4	4	4	5	5	5	6	4	5	4	4	5	4	4
Length	684	1035	1007	1058	1713	543	751	500	1025	2000	723	1566	1324	2000	2000	527	1491	1471	1167	838	658	2000	1062	1569	1151	431	1058	1258	1263	2000	1427	1046	420	497
LinkID	2000049	2000050	2000052	711	2000054	2000056	2000057	2000059	2000060	712	712	2000062	713	1026	1026	1026	2000063	718	2000064	2000067	2000068	720	720	2000070	2000097	721	2000071	2000072	2000074	2000075	2000075	2000081	2000082	723
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	3	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1

						Exit 6						**Exit 5**					**Exit 4**												**Exit 1**					
						MD 28						**MD 189**					**Montrose Rd**						**I-270 Spur**					**Westlake Terrace**	**Democracy Blvd**					**I-270 W Spur/I-495**
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	60	61	61	61	60	60	60	59	59	61	60	60	60	60	61	60	60	61	60	60	59	59	60	60	58	58	58	59	59	57	29	19	20	15
Density	18	14	14	14	18	18	16	20	20	16	16	16	16	16	17	22	22	22	22	20	21	21	17	20	20	20	16	16	16	12	30	60	57	82
LOS	B	B	B	B	C	B	B	C	C	B	B	B	B	B	B	C	C	C	C	C	C	C	B	C	C	C	B	B	B	B	D	F	F	F
Volume	4222	3491	3499	4328	4326	4310	4803	4802	4801	3893	3897	3902	3896	3887	5318	5336	5349	5332	5342	7359	7348	7288	7310	7055	3467	3452	3632	2821	2804	3427	3415	3375	3363	7434
Lanes	4	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4	4	4	6	6	6	7	6	3	3	4	3	3	5	4	3	3	6
Length	1518	2000	1645	473	1022	1591	655	921	1515	2000	1237	1874	2000	1407	598	882	303	2000	1022	2000	1707	722	400	371	2000	1000	963	2000	461	522	937	2000	520	554
LinkID	724	2000093	2000093	2000098	2000099	725	2000115	2000120	727	2000124	2000124	159	194	194	2000134	2000135	728	239	239	129	129	730	443	442	133	133	137	138	138	141	2020142	2115374	2115374	495375
SegmentID	1	1	2	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	2	1	2	1	1	1	1	2	1	1	2	1	1	1	2	1

2045 No-Build AM - I-495 OL Link Evaluation Results 4/25/2022

2045 No-Build AM

I-495 OL

									Exit 2			Exit 3									Exit 4													
	WWB								I-295			MD 210									MD 414													
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	51	57	55	56	57	58	59	59	58	58	58	59	59	59	59	58	59	59	59	59	58	59	59	53	53	53	53	39	28	23	22	17	17	15
Density	34	30	32	32	31	31	23	15	20	20	17	17	20	21	18	23	23	18	22	22	19	22	21	22	27	28	28	38	51	58	62	61	66	78
LOS	D	D	D	D	D	D	C	B	C	C	B	B	C	C	C	C	C	C	C	C	C	C	C	C	D	D	D	E	F	F	F	F	F	F
Volume	8604	8581	5348	5342	5351	5345	2699	2694	2346	2345	2957	2965	2380	4849	5365	5379	5381	5355	5194	5197	5520	5070	5064	5913	5784	5948	5960	5890	5657	5481	5388	5306	4582	4548
Lanes	5	5	3	3	3	3	2	3	2	2	3	3	2	4	5	4	4	5	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4
Length	2000	1268	2000	2000	2000	195	1182	890	2000	1282	2000	1297	1256	824	1314	1054	1042	448	914	495	674	410	694	1037	428	2000	2000	2000	2000	1655	912	602	729	508
LinkID	1	1	218503	218503	218503	218503	218507	218508	218509	218509	318105	318105	217308	217315	217316	971	972	217318	216105	973	216107	216110	974	216112	216115	979	979	979	979	979	980	216114	215901	981
SegmentID	1	2	1	2	3	4	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1

🟥	🟧	🟨	🟩	🟩	Speed Color Scale (mph)
10	30	40	50	70	

	Exit 7									Exit 9								Exit 11											Exit 13					
	MD 5									MD 337								MD 4											Ritchie Marlboro Rd					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	8	51	53	54	53	54	54	53	54	54	54	52	52	52	30	19	16	12	11	11	9	14	13	13	13	13	13	12	12	12	10	17	15	15
Density	113	22	21	19	24	23	24	24	21	21	21	22	28	27	47	69	82	96	116	122	133	111	122	122	120	122	120	102	126	125	129	100	110	109
LOS	F	C	C	C	C	C	C	C	C	C	C	C	D	D	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	4691	4419	4413	5041	4995	5070	5091	5108	4451	4456	4456	5671	5684	5640	5679	5269	5252	5733	5222	5233	6078	6107	6151	6201	6232	6193	6220	6241	5893	5907	6772	6817	6802	6674
Lanes	5	4	4	5	4	4	4	4	4	4	4	5	4	4	4	4	4	5	4	4	5	4	4	4	4	4	4	5	4	4	5	4	4	4
Length	1080	481	657	677	798	2000	773	1493	2000	2000	1594	706	788	515	1390	726	505	449	551	554	462	1023	2000	2000	2000	933	536	940	2000	518	1353	2000	1046	208
LinkID	215904	215905	982	215907	215908	983	983	984	214702	214702	214702	213501	213502	985	986	212301	992	212303	212305	1003	212307	212308	1004	1004	1004	1004	1005	212309	211206	211206	211212	1006	1006	1020
SegmentID	1	1	1	1	1	1	2	1	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	2	1	1	2	1

			Exit 15					Exit 16		Exit 17										Exit 19							Exit 20							
			MD 214					Arena Dr		MD 202										US 50							MD 450							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	14	12	12	15	14	15	21	19	19	19	19	10	13	14	39	54	55	59	57	58	58	58	58	58	42	33	30	29	19	32	54	58	58	56
Density	99	124	111	112	107	98	79	73	89	85	86	120	114	103	48	34	33	25	29	23	25	25	25	24	40	59	50	65	91	65	39	36	36	38
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	D	D	C	D	C	C	C	C	C	E	F	F	F	F	F	E	E	E	E
Volume	6831	5859	6675	6646	7228	7245	6789	6857	4974	4988	4968	7393	7363	7409	7394	7410	7413	7416	6597	6599	5744	5746	5746	8412	8455	7764	7670	7521	8465	8387	8441	8439	8442	8437
Lanes	5	4	5	4	5	5	4	5	3	3	3	6	5	5	4	4	4	5	4	5	4	4	4	6	5	4	5	4	5	4	4	4	4	4
Length	1288	1160	803	743	1378	1328	648	1500	2000	2000	1019	1002	499	722	2000	1520	793	705	785	562	2000	276	288	800	1391	716	276	949	1042	455	2000	2000	2000	1837
LinkID	211214	210903	210905	210906	210909	1022	209703	209704	209710	209710	209710	208515	208516	1023	326	326	1024	208518	207302	207303	207305	207305	1025	207306	207307	206101	206102	206104	206108	206109	1027	1027	1027	1027
SegmentID	1	1	1	1	1	1	1	1	1	2	3	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	3	4

					Exit 22						Exit 23					Exit 24						Exit 25						Exit 27						
					MD 295						MD 201					Greenbelt Metro Station						US 1						I-95						
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	56	53	53	51	50	52	50	51	46	28	22	13	19	23	49	54	54	55	56	58	58	57	37	14	8	8	8	9	9	7	8	8	9
Density	36	30	33	33	33	42	40	35	37	41	56	73	107	89	73	41	32	40	39	33	32	27	24	37	96	146	145	116	136	131	147	130	129	134
LOS	E	D	D	D	D	E	E	E	E	E	F	F	F	F	F	E	D	E	E	D	D	D	C	E	F	F	F	F	F	F	F	F	F	F
Volume	8406	8374	6947	6959	8360	8268	8294	8805	7397	7421	7895	7895	8600	8540	8595	8073	8533	8554	8552	7400	7375	7760	8237	8183	8106	4654	4597	4701	4752	4758	6222	6236	6214	5769
Lanes	4	5	4	4	5	4	4	5	4	4	5	5	6	5	5	4	5	4	4	4	4	5	6	6	6	4	4	5	4	4	6	6	6	5
Length	903	595	570	541	439	501	699	1815	589	828	434	995	471	993	1093	1934	1301	1225	1250	244	973	1149	1517	673	1486	2000	355	1017	490	825	1506	839	1513	814
LinkID	1029	206110	205903	1030	205905	205907	1031	205909	204704	1032	204706	204707	204709	204710	1033	2530009	203501	1034	1036	20020	202306	202308	202311	1035	1038	201103	201103	201104	201105	1039	201106	1040	1042	201107
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1

2045 No-Build AM

I-495 OL

		Exit 28										Exit 29				Exit 30									Exit 31									
		MD 650										MD 193				US 29									MD 97									
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	9	7	8	8	7	9	8	13	14	12	11	10	15	15	15	14	14	11	19	20	20	19	14	16	15	19	18	29	32	32	42	50	51	53
Density	134	141	141	138	146	133	141	110	108	95	124	132	105	103	103	92	108	124	93	89	89	90	99	100	102	96	92	70	64	65	50	41	33	31
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	D	D
Volume	5734	6085	5613	5602	5978	5971	5920	5907	5907	5916	5569	6290	6250	6283	6262	6393	6129	6985	6979	6980	6962	6931	6947	6495	7409	7352	8225	8196	8282	8293	8298	8287	6682	6647
Lanes	5	6	5	5	6	5	5	4	4	5	4	5	4	4	4	5	4	5	4	4	4	4	5	4	5	4	5	4	4	4	4	4	4	4
Length	509	450	501	284	347	1136	1629	1881	1185	301	793	713	805	1020	517	277	854	787	704	2000	832	1091	449	621	594	336	957	536	2000	2000	1795	1336	311	1657
LinkID	1043	7404	2000824	1046	7405	7409	1044	7407	1047	2000762	2000759	2000753	2000752	1049	1050	495302	495303	495304	495305	1051	1051	1053	7024	7026	7028	7029	7031	495316	1055	1055	1055	1056	1970012	495339
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	3	1	1	1

	Exit 33									Exit 34		Exit 35					Exit 36														Exit 39			
	MD 185									MD 355		I-270					MD 187							I-270 W Spur							MD 190			
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	53	53	52	52	50	49	52	52	52	53	53	46	42	35	28	24	15	12	11	14	12	11	10	12	22	23	39	45	44	32	31	23	23	24
Density	28	34	30	38	40	40	38	38	30	33	23	22	32	39	47	41	77	85	94	98	111	122	127	105	74	82	50	43	42	50	54	79	79	70
LOS	D	D	D	E	E	E	E	E	D	D	C	C	D	E	F	E	F	F	F	F	F	F	F	F	F	F	F	E	E	F	F	F	F	F
Volume	7288	7257	7917	7871	7907	7902	7910	7903	7884	6972	3710	4157	4116	4075	3999	3955	3438	2983	4225	4164	4034	3903	3841	3841	9667	9649	9621	9607	9429	9561	8245	7306	7326	8395
Lanes	5	4	5	4	4	4	4	4	5	4	3	4	3	3	3	4	3	3	4	3	3	3	3	3	6	5	5	5	5	6	5	4	4	5
Length	752	746	998	526	1257	2000	87	1045	402	1593	288	910	494	913	1192	325	2000	22	406	1085	2000	2000	2000	1657	551	936	2000	659	446	1032	1585	2000	663	1788
LinkID	1953310	1953311	1953312	1953313	1058	1247	1247	1059	1248	1249	1251	1273	1276	1060	1061	1272	1275	1275	1274	495373	1063	1063	1063	1063	495375	495392	1064	1064	1066	495408	495407	495406	495406	495401
SegmentID	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	3	4	1	1	1	2	1	1	1	1	2	1

					Exit 41	Bridge		Exit 43				Exit 44		
					Clara Barton Pkwy	American Legion		GW Memorial Pkwy				VA 193		
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	43	51	51	53	53	52	51	51	53	53	53	53	53	53
Density	48	41	41	32	39	35	38	31	34	34	30	25	22	27
LOS	F	E	E	D	E	E	E	D	D	D	D	C	C	D
Volume	8365	8393	8242	8364	8215	9205	7790	7834	7084	7090	6405	6683	7082	7076
Lanes	4	4	4	5	4	5	4	5	4	4	4	5	6	5
Length	2000	1149	521	922	1713	1522	284	603	1408	1853	786	1322	853	873
LinkID	495415	495415	1067	495416	495417	495418	170	1069	2530014	152	1083	1084	1101	1114
SegmentID	1	2	1	1	1	1	1	1	1	1	1	1	1	1

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				Exit 44				Exit 43			Bridge		Exit 41								Exit 39													Exit 36
				VA 193				GW Memorial Pkwy			American Legion		Clara Barton Pkwy								MD 190							I-270 W Spur						MD 187
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	44	38	32	28	24	21	20	19	18	17	17	47	52	55	57	56	56	56	54	56	57	57	57	57	54	57	57	54	58	58	57	57	48	57
Density	36	41	49	59	69	60	73	85	88	91	88	45	40	31	30	38	38	38	32	34	28	27	25	30	32	25	25	28	26	26	26	26	23	23
LOS	E	E	F	F	F	F	F	F	F	F	F	E	E	D	D	E	E	E	D	D	D	D	C	D	D	C	C	D	C	C	C	D	C	C
Volume	7938	7840	7764	6666	6604	7608	7472	6397	6355	6309	9171	8370	8407	8509	8513	8481	8499	8498	8483	7587	7898	7869	8608	8439	8594	8608	8611	4490	4481	4474	4474	4483	4483	3942
Lanes	5	5	5	4	4	6	5	4	4	4	6	4	4	5	5	4	4	4	5	4	5	5	6	5	5	6	6	3	3	3	3	3	4	3
Length	2000	183	1499	2000	217	351	1536	673	677	490	672	500	706	1511	777	2000	1461	1064	400	1947	1495	621	1123	398	1764	732	2000	2000	2000	2000	678	1173	305	2000
LinkID	1100	1100	1037	495411	495411	1089	1054	1080	1079	1113	1073	495412	1062	495413	1057	495414	495414	1115	495402	495403	495404	1116	495405	495409	1117	495391	1118	495371	495371	495371	495371	1119	1263	1270
SegmentID	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	30	40	50	70	

						Exit 34										Exit 33										Exit 31								
						MD 355										MD 185										MD 97								
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	57	57	55	51	59	60	52	45	37	47	55	57	51	55	55	58	59	58	56	51	58	60	60	60	57	58	58	59	59	59	58	58	58
Density	21	18	25	25	36	29	22	31	35	42	42	36	28	31	29	24	28	25	32	33	37	32	25	25	25	24	30	25	31	31	31	32	31	31
LOS	C	C	C	C	E	D	C	D	E	E	E	E	D	D	D	C	D	C	D	D	E	D	C	C	C	C	D	C	D	D	D	D	D	D
Volume	3633	4202	4205	4212	3710	6835	7941	7970	7946	7916	7870	7879	7878	7858	6531	6669	6651	7468	7464	7406	7449	7440	7449	6026	5987	6795	6814	7357	7271	7366	7360	7338	7236	7184
Lanes	3	4	3	3	2	4	6	5	5	5	4	4	5	5	4	5	4	5	4	4	4	4	5	4	4	5	4	5	4	4	4	4	4	4
Length	21	439	659	1113	1519	1951	513	1013	1002	521	1603	252	526	658	913	228	793	1635	2000	164	2000	1786	1941	10	942	411	323	1131	452	2000	1086	1248	248	500
LinkID	1270	1271	1257	1121	1258	1250	1260	1261	1120	1262	495331	1122	495332	2000004	495333	495334	495335	495336	495317	495317	2000003	2000003	7015	18877	7017	7019	7021	7023	1953113	1124	1124	1125	1990014	495307
SegmentID	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	2	1	1	1

	Exit 30					Exit 29										Exit 28							Exit 27						Exit 25					
	US 29					MD 193										MD 650							I-95						US 1					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	57	60	60	60	60	55	55	35	52	57	59	61	60	60	60	43	53	59	59	60	61	61	61	61	61	61	59	57	57	26	44	52	53	54
Density	25	27	27	24	27	26	32	43	36	33	32	30	25	29	29	36	34	31	28	28	21	21	17	22	22	24	21	27	27	57	42	35	34	27
LOS	C	D	D	C	D	C	D	E	E	D	D	D	C	D	D	E	D	D	D	D	C	C	B	C	C	C	C	D	D	F	E	E	D	D
Volume	7213	6539	6560	7113	6439	7071	7098	7478	7488	7469	7450	7423	7413	7068	7010	7761	7207	7219	8321	8281	5128	5151	5303	5294	5249	4465	6207	6226	6242	7405	7349	7374	7287	7343
Lanes	5	4	4	5	4	5	4	5	4	4	4	4	5	4	4	5	4	4	5	5	4	4	5	4	4	3	5	4	4	5	4	4	4	5
Length	260	499	524	1562	808	422	768	284	1222	2000	1072	1153	356	352	505	464	500	1046	1496	1493	1028	536	347	2000	140	1527	1473	2000	1605	670	846	626	481	1017
LinkID	495308	495309	1127	495295	2100087	2000197	2000764	2000770	2000771	1129	1129	1130	7410	2201100	1131	7412	101100	1132	101111	1128	101104	1138	101106	101107	101107	1137	101110	102301	102301	102312	102313	1135	1136	102314
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1

	Exit 24					Exit 23							Exit 22												Exit 20					Exit 19				
	Greenbelt Metro Station					MD 201							MD 295												MD 450					US 50				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	54	56	56	54	56	56	56	54	52	55	57	57	55	56	57	58	58	58	58	57	57	57	53	57	52	53	58	58	56	59	59	58	57	57
Density	31	25	25	26	25	22	27	24	31	23	24	24	24	27	26	21	26	26	26	26	26	26	22	23	25	30	22	23	19	20	20	22	27	34
LOS	D	C	C	D	C	C	D	C	D	C	C	C	C	D	C	C	D	D	D	D	D	D	C	C	C	D	C	C	C	C	C	C	D	D
Volume	6730	7069	7048	7055	5615	6135	6119	6522	6494	6505	5428	5428	6494	5940	5912	5997	5994	6010	5993	5977	5974	5947	5819	5306	6460	6434	6411	5294	5310	4726	4743	7651	7653	7656
Lanes	4	5	5	5	4	5	4	5	4	5	4	4	5	4	4	5	4	4	4	4	4	4	5	4	5	4	5	4	5	4	4	6	5	4
Length	2000	1540	1046	440	1150	761	810	740	938	452	520	566	554	497	516	779	711	2000	2000	2000	1629	1217	263	1109	984	561	1359	1371	213	2000	616	1434	754	2000
LinkID	103501	2530003	1139	103502	104704	104706	104707	104709	104710	104711	105902	1140	105904	105906	1141	105908	105909	1142	1142	1142	1142	1143	105910	106105	106108	106109	106110	107301	107302	107307	107307	107309	1144	107311
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	1	1	1	1	1	1	2	1	1	1

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	Exit 17						**Exit 16**					**Exit 15**							**Exit 13**										**Exit 11**					
	MD 202						**Arena Dr**					**MD 214**							**Ritchie Marlboro Rd**										**MD 4**					
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	58	58	58	58	57	59	59	59	60	57	59	60	59	57	59	59	60	60	60	60	60	59	59	58	53	52	48	34	32	31	28	27	23
Density	33	26	26	34	34	34	30	25	25	25	28	22	24	24	31	30	30	24	25	25	23	29	29	29	29	32	27	29	35	42	43	41	52	60
LOS	D	D	D	D	D	D	D	C	C	C	D	C	C	C	D	D	D	C	C	C	C	D	D	D	D	D	D	D	E	E	E	E	F	F
Volume	7609	7618	7647	5875	5855	5833	7013	7310	7316	7309	6426	6428	5810	7140	7127	7104	7023	7090	6056	6053	6825	6824	6831	6822	6823	6823	5662	5603	6062	5390	5348	5746	5661	5586
Lanes	4	5	5	3	3	3	4	5	5	5	4	5	4	5	4	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4
Length	190	855	1495	2000	2000	1908	1069	1470	249	1490	1056	692	986	1397	2000	796	480	997	2000	1072	1492	2000	2000	2000	772	1366	456	484	565	511	527	1147	344	1293
LinkID	107311	107312	1145	108500	108500	108500	109704	109707	1146	1148	110904	110905	110907	110913	1147	1147	1149	110915	111105	111105	111111	111112	111112	111112	111112	1150	112301	1151	112303	112305	1152	112307	112308	1153
SegmentID	2	1	1	1	2	3	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	2	3	4	1	1	1	1	1	1	1	1	1

				Exit 9									**Exit 7**													**Exit 4**								
				MD 337									**MD 5**													**MD 414**								
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	19	16	13	10	9	8	9	10	8	6	6	4	3	4	4	5	5	5	5	5	5	5	5	5	6	6	8	8	7	11	10	7	6	5
Density	72	66	93	113	127	112	122	113	136	143	149	180	176	174	175	164	165	164	164	161	163	163	132	160	142	118	114	113	112	91	93	135	102	155
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	5450	5371	4732	4548	4373	4529	4438	4396	4334	4340	4333	2685	3061	3068	3375	3346	3321	3364	3376	3390	3390	3378	3379	3280	3239	3729	3558	3551	4024	4021	3894	1946	1956	1550
Lanes	4	5	4	4	4	5	4	4	4	5	5	4	5	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4	5	4	4	2	3	2
Length	896	625	2000	2000	770	663	823	2000	727	761	1487	1134	789	706	691	807	2000	2000	2000	2000	670	860	617	1155	507	909	508	589	349	2000	55	1054	1707	1386
LinkID	1154	112309	113503	113503	113503	114701	114702	1155	1155	114703	1157	115905	115910	115911	115913	115914	1158	1158	1158	1158	1158	1159	115915	116102	1161	116104	116106	1162	116108	116109	116109	116110	116111	117305
SegmentID	1	1	1	2	3	1	1	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	1	2	1	1	1

	Exit 3						**Exit 2**							
	MD 210						**I-295**							**WWB**
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	5	8	9	12	14	14	18	43	57	57	58	57	49	57
Density	147	130	101	98	86	110	86	52	34	34	34	34	38	32
LOS	F	F	F	F	F	F	F	F	D	D	D	D	E	D
Volume	3069	3035	3636	3639	3642	3166	4612	4522	5832	5827	5824	5787	9135	9139
Lanes	4	3	4	3	3	2	3	2	3	3	3	3	5	5
Length	907	581	640	2000	598	1132	851	1030	2000	2000	2000	1329	2000	1262
LinkID	117307	117308	117310	117311	117311	118503	118504	118506	118508	118508	118508	118508	44	44
SegmentID	1	1	1	1	2	1	1	1	1	2	3	4	1	2

2045 No-Build AM - I-270 NB Link Evaluation Results **4/25/2022**

2045 No-Build AM

I-270 NB

						Exit 1												Exit 4				Exit 5					Exit 6							Exit 8
		I-270 W Spur/I-495				Democracy Blvd		Westlake Terrace				I-270 Spur						Montrose Rd				MD 189					MD 28							Shady Grove Rd
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	57	58	62	62	63	63	64	63	64	64	64	64	63	63	64	64	64	64	63	63	64	64	62	63	64	63	63	63	64	64	64	64	63	64
Density	25	24	22	16	17	13	17	14	14	11	14	16	15	15	15	14	14	14	14	16	15	15	16	13	13	14	14	14	14	14	12	12	13	13
LOS	**C**	**C**	**C**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**
Volume	8611	4096	4083	4079	3193	3372	3325	3511	3489	3592	3591	6190	6708	6696	6689	4391	4380	4381	4389	3936	3927	3923	3918	3258	3252	4276	4273	3600	3599	3598	3955	3949	3944	3224
Lanes	6	3	3	4	3	4	3	4	4	5	4	6	7	7	7	5	5	5	5	4	4	4	4	4	4	5	5	4	4	4	5	5	5	4
Length	2000	2000	455	894	790	887	457	820	1170	718	1863	447	1521	1210	1533	2000	954	425	1486	2000	1344	1921	1536	1407	531	640	1405	464	2000	1696	1482	1475	1523	2000
LinkID	1118	495372	495372	232	234	235	237	134	241	242	243	274	275	738	739	280	280	428	742	289	289	251	743	300	744	304	305	316	745	745	320	741	747	327
SegmentID	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	

				Exit 9						Exit 10		Exit 11											Exit 13				Exit 15						Exit 16	
				I-370						MD 117		MD 124			Watkins Mill Rd								Middlebrook Rd				MD 118						MD 27	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	64	64	64	64	63	63	60	62	63	64	64	64	64	64	63	63	63	64	64	64	64	64	63	63	63	63	63	63	63	62	62	63	63	63
Density	13	10	13	13	13	13	13	15	15	14	14	14	14	14	12	16	14	14	14	14	12	13	13	15	15	12	14	17	17	15	16	16	13	17
LOS	**B**	**A**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**
Volume	3213	3204	3204	3194	3206	3205	4744	4766	4760	3506	3507	3504	3496	3482	3944	3972	4491	4489	4481	4451	4461	4053	4100	3826	3830	3812	3581	3159	3163	3671	3080	3097	3301	3279
Lanes	4	5	4	4	4	4	6	5	5	4	4	4	4	4	5	4	5	5	5	5	6	5	5	4	4	5	4	3	3	4	3	3	4	3
Length	1947	337	1171	633	2000	1616	531	843	1357	2000	2000	2000	1479	584	763	592	1112	2000	2000	725	763	636	672	874	672	820	1561	1090	527	1717	520	1157	771	687
LinkID	327	335	339	749	411	411	347	348	754	350	350	350	350	362	363	762	2430241	2430244	2430244	763	364	365	367	369	764	370	372	374	765	376	378	766	380	381
SegmentID	2	1	1	1	1	2	1	1	1	1	2	3	4	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

											Exit 18																Exit 22							
											MD 121																MD 109							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	63	63	63	63	63	63	63	63	62	63	59	62	63	63	63	62	63	63	63	63	63	63	63	63	63	63	61	63	62	62	62	62	62	62
Density	13	18	18	18	18	18	18	18	14	13	13	12	16	16	16	16	24	24	24	24	24	24	24	24	24	24	17	23	16	24	24	24	24	23
LOS	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**B**	**C**	**B**	**C**	**C**	**C**	**C**	**C**
Volume	3373	3389	3389	3387	3383	3385	3387	3376	3371	2503	3063	3075	3060	3085	3072	3065	3047	3052	3040	3028	3055	3031	3032	3036	3040	3029	3031	2898	2957	2952	2947	2935	2932	2916
Lanes	4	3	3	3	3	3	3	3	4	3	4	4	3	3	3	3	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2
Length	457	1044	2000	2000	2000	2000	718	756	736	920	211	877	400	1727	2000	1731	2000	2000	905	482	2000	383	1176	2000	1202	1164	340	1049	452	1025	2000	2000	2000	2000
LinkID	383	384	767	767	767	767	767	768	385	387	389	1001	390	769	391	391	272	272	272	392	394	394	395	396	396	750	397	399	401	402	771	771	771	771
SegmentID	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	2	1	2	3	1	1	2	1	1	2	1	1	1	1	1	1	2	3	4

							Exit 26																				Exit 31				
							MD 80																				MD 85				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	62	62	62	62	62	61	57	61	59	60	62	63	63	63	63	63	63	63	63	63	63	63	62	62	62	62	62	58	63	61	63
Density	23	23	23	23	23	23	16	21	18	26	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	17	23	16	19	14	14
LOS	**C**	**C**	**C**	**C**	**C**	**C**	**B**	**C**	**B**	**D**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**B**	**C**	**B**	**C**	**B**	**B**
Volume	2898	2894	2891	2887	2885	2866	2823	2571	3151	3142	3150	3138	3137	3136	3143	3129	3124	3090	3130	3127	3128	3125	3119	3114	3103	3110	2866	2826	2386	3479	3473
Lanes	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	4	4
Length	1502	2000	1497	2000	698	1279	214	773	615	868	2000	2000	2000	2000	1813	539	1225	391	2000	2000	2000	2000	2000	178	1025	473	1416	241	945	1115	392
LinkID	771	412	412	446	446	783	403	405	407	408	784	784	784	784	784	1010	1017	1007	869	869	869	869	869	869	785	415	417	421	423	425	577
SegmentID	5	1	2	1	2	1	1	1	1	1	1	2	3	4	5	1	1	1	1	2	3	4	5	6	1	1	1	1	1	1	1

2045 No-Build AM - I-270 SB Link Evaluation Results 4/25/2022

2045 No-Build AM

I-270 SB

					Exit 31																			**Exit 26**										
					MD 85																			**MD 80**										
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	12	12	12	10	10	9	8	7	16	16	16	16	16	16	16	16	16	15	15	15	15	14	14	12	12	13	17	24	24	23	22	22	21	22
Density	107	106	109	135	135	95	144	141	96	94	95	95	96	95	95	94	94	96	98	97	98	100	101	81	111	88	102	72	71	74	77	77	78	77
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	3819	3790	3821	2633	2636	2613	2266	3064	3042	3043	3020	3015	3010	3021	2976	2979	2960	2918	2896	2894	2851	2815	2823	2816	2605	3534	3534	3508	3430	3440	3393	3302	3335	3367
Lanes	3	3	3	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2
Length	931	404	446	474	1052	294	849	378	1140	2000	2000	2000	2000	2000	262	2000	2000	2000	2000	2000	2000	548	1088	376	654	1400	110	1849	565	2000	2000	57	2000	2000
LinkID	683	2000012	157	2000014	699	2000016	2000017	2000020	2000021	703	703	703	703	703	703	448	448	448	448	448	448	448	704	201	2000022	2000025	2000026	705	447	455	455	455	453	453
SegmentID	1	1	1	1	1	1	1	1	1	1	2	3	4	5	6	1	2	3	4	5	6	7	1	1	1	1	1	1	1	1	2	3	1	2

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	

					Exit 22																			**Exit 18**										
					MD 109																			**MD 121**										
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	21	20	20	20	19	19	18	19	25	27	26	26	26	26	26	25	24	25	25	13	9	8	7	7	9	10	12	12	12	12	12	12	10	8
Density	79	81	82	82	56	85	70	94	75	69	71	72	72	71	72	73	75	74	73	90	128	108	151	147	137	115	127	127	122	119	123	124	109	145
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	3342	3305	3278	3275	3242	3235	3754	3675	3722	3681	3670	3690	3686	3662	3673	3675	3635	3639	3625	3625	3568	3519	3067	3848	3845	4405	4448	4443	4454	4437	4412	4378	4389	3490
Lanes	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4	3	4	3	4	3	3	3	3	3	3	4	3
Length	2000	1801	1775	948	546	716	1664	92	2000	406	487	2000	475	658	2000	2000	856	2000	1724	624	766	708	839	828	553	1076	2000	2000	2000	2000	214	890	618	1871
LinkID	453	453	410	706	2000027	2000029	2000031	2000032	707	707	2000033	2000034	2000034	2000036	2000037	2000037	2000037	260	260	2000038	708	2000039	2000041	1002	2000044	709	2020578	2020578	2020578	2020578	2020578	710	2000045	2000047
SegmentID	3	4	1	1	1	1	1	1	1	2	1	1	2	1	1	2	3	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1

	Exit 16					**Exit 15**				**Exit 13**										**Exit 11**			**Exit 10**						**Exit 9**				**Exit 8**	
	MD 27					**MD 118**				**Middlebrook Rd**							**Watkins Mill Rd**			**MD 124**			**MD 117**						**I-370**				**Shady Grove Rd**	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	8	12	11	11	12	12	14	14	23	25	25	25	29	28	24	16	12	12	16	15	18	18	18	32	46	42	51	50	52	53	53	52	50	50
Density	142	124	115	109	122	97	115	94	78	72	72	73	62	63	74	97	112	114	100	98	99	101	101	57	40	42	30	35	27	22	23	24	32	32
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	E	D	E	D	C	C	C	D	D
Volume	4381	4349	4994	4964	4494	4808	4760	5352	5359	5394	5437	7172	7169	7117	7122	6078	5310	5277	6285	7302	7272	7316	7333	9075	9099	8988	9077	6954	6949	4790	4796	6317	6316	6310
Lanes	4	3	4	4	3	4	3	4	3	3	3	4	4	4	4	4	4	4	4	5	4	4	4	5	5	5	6	4	5	4	4	5	4	4
Length	684	1035	1007	1058	1713	543	751	500	1025	2000	723	1566	1324	2000	720	1088	1581	595	1135	838	658	2000	1062	1569	1151	431	1058	1258	1263	2000	1427	1046	420	497
LinkID	2000049	2000050	2000052	711	2000054	2000056	2000057	2000059	2000060	712	712	2000062	713	1026	1026	5020423	2000063	718	2000064	2000067	2000068	720	720	2000070	2000097	721	2000071	2000072	2000074	2000075	2000075	2000081	2000082	723
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1

						Exit 6						**Exit 5**					**Exit 4**											**Exit 1**						
						MD 28						**MD 189**					**Montrose Rd**						**I-270 Spur**				**Westlake Terrace**	**Democracy Blvd**						**I-270 W Spur/I-495**
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	53	53	53	52	53	53	51	51	53	53	53	53	53	53	53	53	53	41	26	34	50	52	52	53	53	53	53	53	51	51	52	39	22
Density	30	24	24	22	29	28	25	32	32	27	27	27	27	27	29	29	29	29	38	62	48	32	27	28	23	24	22	25	25	23	29	38	50	74
LOS	D	C	C	C	D	D	C	D	D	D	D	D	D	D	D	D	D	D	E	F	F	D	D	D	C	C	C	C	C	C	D	E	F	F
Volume	6300	5049	5056	5947	5958	5953	6498	6495	6506	5723	5731	5753	5758	5761	7634	7672	7703	7690	7703	11415	11329	11219	11264	10127	4997	5003	5920	5344	5352	5854	5829	5860	5869	9667
Lanes	4	4	4	5	4	4	5	4	4	4	4	4	4	4	5	5	5	5	5	7	7	7	8	7	4	4	5	4	4	5	4	3	3	6
Length	1518	2000	1645	473	1022	1591	655	921	1515	2000	1237	1874	2000	1407	598	882	303	2000	1023	2000	1707	722	400	330	2000	999	962	2000	457	522	937	2000	520	551
LinkID	724	2000093	2000093	2000098	2000099	725	2000115	2000120	727	2000124	2000124	159	194	194	2000134	2000135	728	239	239	129	129	730	443	442	133	133	137	138	138	141	2020142	2115374	2115374	495375
SegmentID	1	1	2	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	2	1	2	1	1	1	1	2	1	1	2	1	1	1	2	1

2045 No-Build PM - I-495 OL Link Evaluation Results 4/25/2022

2045 No-Build PM

I-495 OL

									Exit 2			Exit 3									Exit 4													
	WWB								I-295			MD 210									MD 414													
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	16	22	56	56	57	58	58	58	58	58	56	57	58	58	56	52	57	58	58	58	57	58	58	53	53	53	53	53	52	53	53	53	53	43
Density	108	81	28	28	28	28	28	19	23	24	26	26	29	27	26	35	32	25	27	27	23	26	25	24	29	30	30	30	31	30	30	24	24	29
LOS	F	F	D	D	D	D	D	C	C	C	D	C	D	D	C	D	D	C	D	D	C	C	C	C	D	D	D	D	D	D	D	C	C	D
Volume	8769	8761	4746	4759	4763	4769	3321	3319	2708	2712	4372	4380	3308	6333	7226	7254	7246	7205	6334	6348	6582	5934	5929	6349	6206	6381	6383	6380	6379	6378	6353	6322	5076	5060
Lanes	5	5	3	3	3	3	2	3	2	2	3	3	2	4	5	4	4	5	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4
Length	2000	2000	2000	2000	2000	195	1182	890	2000	1282	2000	1297	1256	824	1314	1054	1042	448	914	495	674	410	694	1037	428	2000	2000	2000	2000	1655	912	602	729	508
LinkID	1	1	218503	218503	218503	218503	218507	218508	218509	218509	318105	318105	217308	217315	217316	971	972	217318	216105	973	216107	216110	974	216112	216115	979	979	979	979	979	980	216114	215901	981
SegmentID	1	2	1	2	3	4	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1

Speed Color Scale (mph)

🟥	🟧	🟨	🟩	🟩
10	30	40	50	70

	Exit 7									Exit 9								Exit 11												Exit 13					
	MD 5									MD 337								MD 4												Ritchie Marlboro Rd					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	31	21	16	13	18	19	18	17	16	15	15	14	27	29	26	20	19	15	19	19	16	24	24	22	21	19	18	16	14	13	12	21	18	16
Density	37	65	85	98	88	81	88	90	93	97	94	94	62	57	64	72	75	83	79	77	86	71	70	74	77	83	87	80	105	107	111	79	90	98
LOS	E	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	5733	5406	5365	6383	6235	6273	6214	6187	5757	5764	5742	6692	6704	6635	6624	5725	5650	6443	5847	5789	6765	6722	6712	6628	6546	6467	6373	6400	5763	5746	6545	6568	6539	6391
Lanes	5	4	4	5	4	4	4	4	4	4	4	5	4	4	4	4	4	5	4	4	5	4	4	4	4	4	4	5	4	4	5	4	4	4
Length	1080	481	657	677	798	2000	773	1493	2000	2000	1594	706	788	515	1390	726	505	449	551	554	462	1023	2000	2000	2000	933	536	940	2000	518	1353	2000	1046	208
LinkID	215904	215905	982	215907	215908	983	983	984	214702	214702	214702	213501	213502	985	986	212301	992	212303	212305	1003	212307	212308	1004	1004	1004	1004	1005	212309	211206	211206	211212	1006	1006	1020
SegmentID	1	1	1	1	1	1	2	1	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	2	1	1	2	1

			Exit 15					Exit 16		Exit 17										Exit 19							Exit 20							
			MD 214					Arena Dr		MD 202										US 50							MD 450							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	12	10	10	13	13	14	15	16	14	14	14	10	15	17	24	42	47	46	34	25	15	13	12	13	15	14	13	11	10	14	15	15	14	14
Density	105	136	121	118	106	95	103	78	117	116	116	117	96	84	77	43	38	31	41	45	76	92	95	83	88	103	87	122	125	109	96	101	105	106
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	E	D	E	E	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	6527	5261	6244	6250	6710	6686	6311	6422	4829	4831	4812	7260	7253	7291	7290	7311	7274	7265	5583	5517	4696	4598	4545	6503	6503	5568	5452	5192	5977	5900	5934	5928	5911	5890
Lanes	5	4	5	4	5	5	4	5	3	3	3	6	5	5	4	4	4	5	4	5	4	4	4	6	5	4	5	4	5	4	4	4	4	4
Length	1288	1160	803	743	1378	1328	648	1500	2000	2000	1020	1002	499	722	2000	1520	793	705	785	562	2000	276	520	571	1391	716	276	949	1042	455	2000	2000	2000	1837
LinkID	211214	210903	210905	210906	210909	1022	209703	209704	209710	209710	209710	208515	208516	1023	326	326	1024	208518	207302	207303	207305	207305	1025	207306	207307	206101	206102	206104	206108	206109	1027	1027	1027	1027
SegmentID	1	1	1	1	1	1	1	1	1	2	3	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	3	4

					Exit 22						Exit 23					Exit 24						Exit 25						Exit 27						
					MD 295						MD 201					Greenbelt Metro Station						US 1						I-95						
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	14	11	10	10	10	14	15	13	14	15	12	13	12	17	23	48	56	54	48	51	56	57	56	56	50	57	58	58	58	58	53	53	53	53
Density	105	107	125	119	126	107	101	100	106	100	117	108	111	93	69	39	30	39	44	37	34	29	27	27	30	22	21	17	22	22	23	23	23	25
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	D	E	E	E	D	D	D	D	D	C	C	B	C	C	C	C	C	C
Volume	5875	5850	4921	4957	6192	6112	6121	6758	6110	6132	7046	7128	7938	7893	7933	7515	8387	8408	8416	7685	7649	8240	9096	9091	9074	4996	4957	5014	5053	5030	7344	7362	7347	6666
Lanes	4	5	4	4	5	4	4	5	4	4	5	5	6	5	5	4	5	4	4	4	4	5	6	6	6	4	4	5	4	4	6	6	6	5
Length	903	595	570	541	439	501	699	1815	589	828	434	995	471	993	1104	1978	1301	1225	1250	244	973	1149	1517	673	1486	2000	355	1017	490	825	1506	839	1513	814
LinkID	1029	206110	205903	1030	205905	205907	1031	205909	204704	1032	204706	204707	204709	204710	1033	2530009	203501	1034	1036	20020	202306	202308	202311	1035	1038	201103	201103	201104	201105	1039	201106	1040	1042	201107
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1

2045 No-Build PM

I-495 OL

		Exit 28										Exit 29				Exit 30									Exit 31									
		MD 650										MD 193				US 29									MD 97									
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	53	51	52	53	52	53	50	50	52	53	53	53	52	53	53	53	50	46	44	44	43	42	38	32	27	32	31	33	34	32	31	23	20	14
Density	25	23	24	24	22	27	28	35	33	26	29	26	33	32	32	27	33	33	42	41	42	43	38	46	52	54	47	54	53	55	56	76	74	106
LOS	C	C	C	C	C	D	D	E	D	D	D	C	D	D	D	D	D	D	E	E	E	E	E	F	F	F	F	F	F	F	F	F	F	F
Volume	6629	7119	6394	6392	6997	7009	6991	6993	6957	6984	6178	6827	6779	6817	6791	7042	6682	7450	7404	7354	7289	7233	7231	5985	6915	6792	7251	7194	7161	7112	7012	6982	5949	5868
Lanes	5	6	5	5	6	5	5	4	4	5	4	5	4	4	4	5	4	5	4	4	4	4	5	4	5	4	5	4	4	4	4	4	4	4
Length	509	450	501	284	347	1136	1629	1881	1185	301	793	713	805	1020	517	277	854	787	704	2000	832	1091	449	719	500	336	957	536	2000	2000	1795	1336	311	1657
LinkID	1043	7404	2000824	1046	7405	7409	1044	7407	1047	2000762	2000759	2000753	2000752	1049	1050	495302	495303	495304	495305	1051	1051	1053	7024	7026	7028	7029	7031	495316	1055	1055	1055	1056	1970012	495339
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	3	1	1	1

	Exit 33									Exit 34		Exit 35					Exit 36														Exit 39			
	MD 185									MD 355		I-270					MD 187							I-270 W Spur							MD 190			
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	11	15	15	18	22	23	20	19	18	15	8	8	9	8	7	7	6	6	6	8	8	8	9	11	14	17	18	19	19	19	16	16	16	17
Density	115	112	93	99	79	74	88	91	76	99	120	102	127	135	147	119	160	139	149	146	147	146	131	110	93	90	86	81	78	67	82	99	98	84
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	6574	6523	7016	6940	6937	6903	6837	6794	6734	5763	2956	3344	3303	3239	3165	3120	2818	2515	3467	3471	3467	3474	3483	3495	7586	7601	7670	7669	7571	7635	6754	6207	6167	7029
Lanes	5	4	5	4	4	4	4	4	5	4	3	4	3	3	3	4	3	3	4	3	3	3	3	3	6	5	5	5	5	6	5	4	4	5
Length	752	746	998	526	1257	2000	87	1045	402	1593	288	910	494	913	1192	325	2000	22	406	1085	2000	2000	2000	1657	554	939	2000	659	446	1032	1585	2000	663	1788
LinkID	1953310	1953311	1953312	1953313	1058	1247	1247	1059	1248	1249	1251	1273	1276	1060	1061	1272	1275	1275	1274	495373	1063	1063	1063	1063	495375	495392	1064	1064	1066	495408	495407	495406	495406	495401
SegmentID	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	3	4	1	1	1	2	1	1	1	1	2	1

					Exit 41	Bridge		Exit 43				Exit 44		
					Clara Barton Pkwy	American Legion		GW Memorial Pkwy				VA 193		
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	21	21	24	25	26	42	53	53	54	54	54	54	54	53
Density	82	83	72	56	68	40	33	26	27	27	24	23	21	25
LOS	F	F	F	F	F	E	D	D	D	D	C	C	C	C
Volume	7039	7038	6925	7026	6993	8475	6960	6923	5781	5783	5120	6210	6785	6776
Lanes	4	4	4	5	4	5	4	5	4	4	4	5	6	5
Length	2000	1149	521	922	1713	1524	284	602	2000	404	728	1316	842	613
LinkID	495415	495415	1067	495416	495417	495418	170	1069	2530014	2530014	1083	1084	1101	1114
SegmentID	1	2	1	1	1	1	1	1	1	2	1	1	1	1

2045 No-Build PM - I-495 IL Link Evaluation Results 4/25/2022

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				Exit 44				Exit 43			Bridge		Exit 41								Exit 39													Exit 36
				VA 193				GW Memorial Pkwy			American Legion		Clara Barton Pkwy								MD 190						I-270 W Spur						MD 187
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	16	16	11	9	6	8	11	14	15	15	17	17	13	14	19	17	17	16	13	12	12	11	17	27	26	26	12	10	8	7	6	6	5
Density	20	65	65	107	118	141	133	118	98	89	95	105	104	115	101	94	104	105	90	119	125	124	124	97	62	52	52	92	109	130	142	148	120	169
LOS	C	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	5186	5113	5113	4550	4453	5458	5453	5404	5434	5421	8527	7120	7155	7328	7332	7254	7227	7172	7097	6303	7475	7413	8400	8179	8247	8215	8129	3313	3163	2983	2865	2796	2745	2431
Lanes	5	5	5	4	4	6	5	4	4	4	6	4	4	5	5	4	4	4	5	4	5	5	6	5	5	6	6	3	3	3	3	3	4	3
Length	2000	1468	1468	2000	206	354	1526	667	665	488	674	500	706	1511	777	2000	1461	1064	400	1943	1495	621	1123	398	1764	732	2000	2000	2000	2000	705	1173	305	2000
LinkID	1100	1037	1037	495411	495411	1089	1054	1080	1079	1113	1073	495412	1062	495413	1057	495414	495414	1115	495402	495403	495404	1116	495405	495409	1117	495391	1118	495371	495371	495371	495371	1119	1263	1270
SegmentID	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1

🟥	🟧	🟨	🟩	🟩	Speed Color Scale (mph)
10	30	40	50	70	

						Exit 34										Exit 33										Exit 31								
						MD 355										MD 185										MD 97								
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	5	5	6	7	9	11	12	13	13	13	15	15	13	13	12	11	13	14	21	21	21	20	21	20	16	15	18	20	22	28	26	24	23	21
Density	154	130	154	133	138	127	94	100	102	101	110	111	95	100	121	109	117	108	87	87	88	92	71	81	102	98	98	78	87	70	76	81	83	87
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	2234	2669	2667	2682	2530	5465	6509	6523	6546	6509	6458	6423	6404	6395	5719	6021	6001	7398	7340	7227	7314	7424	7420	6602	6556	7251	7265	7835	7754	7821	7793	7764	7542	7485
Lanes	3	4	3	3	2	4	6	5	5	5	4	4	5	5	4	5	4	5	4	4	4	4	5	4	4	5	4	5	4	4	4	4	4	4
Length	21	439	659	1113	1519	1951	513	1013	1002	522	1603	252	526	658	913	228	793	1635	2000	164	2000	1786	1941	10	943	411	323	1131	452	2000	1086	1248	248	500
LinkID	1270	1271	1257	1121	1258	1250	1260	1261	1120	1262	495331	1122	495332	2000004	495333	495334	495335	495336	495317	495317	2000003	2000003	7015	18877	7017	7019	7021	7023	1953113	1124	1124	1125	1990014	495307
SegmentID	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	2	1	1	1

	Exit 30					Exit 29										Exit 28							Exit 27						Exit 25					
	US 29					MD 193										MD 650							I-95						US 1					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	21	17	16	15	18	17	20	20	27	28	37	42	40	38	33	28	31	37	36	22	21	20	17	14	12	9	12	13	13	17	27	39	46	51
Density	71	96	104	98	98	88	92	82	75	73	54	48	40	50	57	59	64	53	48	75	61	66	63	95	113	137	101	120	119	91	73	50	41	31
LOS	F	F	F	F	F	F	F	F	F	F	F	F	E	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	D
Volume	7524	6600	6642	7619	6973	7511	7526	8060	8107	8112	8093	8053	8026	7559	7486	8231	7798	7783	8537	8398	5203	5194	5460	5386	5277	3505	6141	6166	6171	7741	7719	7752	7662	7743
Lanes	5	4	4	5	4	5	4	5	4	4	4	4	5	4	4	5	4	4	5	5	4	4	5	4	4	3	5	4	4	5	4	4	4	5
Length	260	499	524	1562	808	422	768	284	1222	2000	1072	1153	356	352	505	464	500	1046	1496	1493	1028	536	347	2000	140	1527	1473	2000	1605	671	846	626	481	1017
LinkID	495308	495309	1127	495295	2100087	2000197	2000764	2000770	2000771	1129	1129	1130	7410	2201100	1131	7412	101100	1132	101111	1128	101104	1138	101106	101107	101107	1137	101110	102301	102301	102312	102313	1135	1136	102314
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1

	Exit 24					Exit 23							Exit 22												Exit 20					Exit 19				
	Greenbelt Metro Station					MD 201							MD 295												MD 450					US 50				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	53	53	54	54	38	28	21	39	50	52	52	49	49	51	53	52	53	53	52	52	53	52	52	40	46	52	53	52	53	32	26	29	46
Density	35	34	29	29	29	38	63	75	50	31	31	32	33	39	37	28	36	36	36	37	36	36	29	33	40	44	31	30	24	28	45	54	58	46
LOS	D	D	D	D	D	E	F	F	F	D	D	D	D	E	E	D	E	E	E	E	E	E	D	D	E	E	D	D	C	D	F	F	F	F
Volume	7293	7311	7784	7805	6300	7075	7042	7756	7731	7744	6602	6616	8165	7554	7518	7597	7592	7617	7620	7622	7624	7609	7444	6839	8056	8020	8020	6306	6337	5869	5882	8307	8376	8387
Lanes	4	4	5	5	4	5	4	5	4	5	4	4	5	4	4	5	4	4	4	4	4	4	5	4	5	4	5	4	5	4	4	6	5	4
Length	2000	58	1046	440	1150	761	810	740	938	452	520	566	554	497	516	779	711	2000	2000	2000	1629	1217	263	1180	915	561	1359	1371	213	2000	616	1434	754	2000
LinkID	103501	103501	1139	103502	104704	104706	104707	104709	104710	104711	105902	1140	105904	105906	1141	105908	105909	1142	1142	1142	1142	1143	105910	106105	106108	106109	106110	107301	107302	107307	107307	107309	1144	107311
SegmentID	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	1	1	1	1	1	1	2	1	1	1

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I-495 IL

	Exit 17 MD 202						Exit 16 Arena Dr					Exit 15 MD 214							Exit 13 Ritchie Marlboro Rd										Exit 11 MD 4					
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	50	52	53	53	53	53	52	49	49	48	48	52	52	48	50	52	52	54	53	53	53	53	53	51	51	50	52	53	50	52	52	52	52	53
Density	42	32	32	39	39	39	36	32	32	32	37	27	31	32	39	37	37	29	29	29	28	35	35	36	36	37	32	31	30	31	31	28	35	35
LOS	E	D	D	E	E	E	E	D	D	D	E	D	D	D	E	E	E	D	D	D	D	D	E	E	E	E	D	D	D	D	D	D	E	D
Volume	8337	8355	8397	6212	6222	6213	7387	7756	7756	7740	7050	7065	6499	7789	7801	7807	7719	7805	6180	6170	7397	7389	7401	7413	7424	7424	6622	6615	7474	6490	6500	7320	7299	7300
Lanes	4	5	5	3	3	3	4	5	5	5	4	5	4	5	4	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4
Length	190	855	1495	2000	2000	1908	1069	1470	249	1490	1056	692	986	1397	2000	796	480	997	2000	1072	1492	2000	2000	2000	772	1366	456	484	565	511	527	1147	344	1293
LinkID	107311	107312	1145	108500	108500	108500	109704	109707	1146	1148	110904	110905	110907	110913	1147	1147	1149	110915	111105	111105	111111	111112	111112	111112	111112	1150	112301	1151	112303	112305	1152	112307	112308	1153
SegmentID	2	1	1	1	2	3	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	2	3	4	1	1	1	1	1	1	1	1	1

				Exit 9 MD 337									Exit 7 MD 5														Exit 4 MD 414							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	53	53	61	63	63	60	57	54	55	61	63	63	62	62	63	63	63	63	63	63	63	62	62	63	63	61	62	63	58	60	60	62	63	63
Density	34	28	28	27	27	25	33	35	35	25	24	19	19	24	20	25	25	25	25	25	25	25	20	24	24	21	23	22	21	25	25	26	17	19
LOS	D	D	D	D	D	C	D	E	D	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	B	C
Volume	7272	7281	6833	6833	6797	7585	7551	7599	7569	7577	7569	4799	5989	6002	6244	6291	6317	6310	6310	6294	6287	6262	6259	5986	5934	6339	5607	5593	6131	6152	6037	3235	3247	2420
Lanes	4	5	4	4	4	5	4	4	4	5	5	4	5	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4	5	4	4	2	3	2
Length	896	625	2000	2000	770	663	823	2000	727	761	1487	1134	789	706	691	807	2000	2000	2000	2000	670	860	617	1155	507	909	508	589	349	2000	55	1054	1707	1386
LinkID	1154	112309	113503	113503	113503	114701	114702	1155	1155	114703	1157	115905	115910	115911	115913	115914	1158	1158	1158	1158	1158	1159	115915	116102	1161	116104	116106	1162	116108	116109	116109	116110	116111	117305
SegmentID	1	1	1	2	3	1	1	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	1	2	1	1	1

	Exit 3 MD 210						Exit 2 I-295							WWB
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	59	60	58	56	57	57	48	50	52	53	53	53	57	57
Density	13	17	15	20	20	26	28	37	35	34	34	34	30	30
LOS	B	B	B	C	C	D	D	E	D	D	D	D	D	D
Volume	3015	2998	3471	3460	3451	3037	4078	3707	5440	5437	5423	5390	8568	8596
Lanes	4	3	4	3	3	2	3	2	3	3	3	3	5	5
Length	907	581	640	2000	598	1132	851	1030	2000	2000	2000	1329	2000	1262
LinkID	117307	117308	117310	117311	117311	118503	118504	118506	118508	118508	118508	118508	44	44
SegmentID	1	1	1	1	2	1	1	1	1	2	3	4	1	2

2045 No-Build PM - I-270 NB Link Evaluation Results 4/25/2022

2045 No-Build PM
I-270 NB

		I-270 W Spur/I-495				Exit 1 Democracy Blvd		Westlake Terrace				I-270 Spur						Exit 4 Montrose Rd				Exit 5 MD 189					Exit 6 MD 28							Exit 8 Shady Grove Rd
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	26	51	53	54	54	53	53	53	53	51	52	49	49	52	53	51	52	52	47	52	53	52	39	48	41	38	35	33	32	33	28	23	19	18
Density	52	30	29	22	26	21	28	25	25	24	29	35	32	30	30	33	33	32	36	35	35	36	48	34	38	41	44	52	51	51	55	64	77	69
LOS	F	D	D	C	C	C	D	C	C	C	D	D	D	D	D	D	D	D	E	E	E	E	F	D	E	E	E	F	F	F	F	F	F	F
Volume	8129	4623	4628	4634	4121	4399	4345	5375	5362	6071	6084	10111	11009	11025	11026	8451	8449	8452	8481	7439	7434	7462	7490	6481	6375	7791	7686	6788	6684	6606	7642	7522	7318	5102
Lanes	6	3	3	4	3	4	3	4	4	5	4	6	7	7	7	5	5	5	5	4	4	4	4	4	4	5	5	4	4	4	5	5	5	4
Length	2000	2000	479	894	790	887	457	820	1170	717	1850	447	1521	1210	1533	2000	955	425	1486	2000	1344	1921	1536	1407	531	640	1405	464	2000	1696	1482	1475	1523	2000
LinkID	1118	495372	495372	232	234	235	237	134	241	242	243	274	275	738	739	280	280	428	742	289	289	251	743	300	744	304	305	316	745	745	320	741	747	327
SegmentID	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1

🟥	🟧	🟨	🟩	🟩	
10	30	40	50	70	Speed Color Scale (mph)

				Exit 9 I-370						Exit 10 MD 117		Exit 11 MD 124			Watkins Mill Rd								Exit 13 Middlebrook Rd				Exit 15 MD 118						Exit 16 MD 27	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	11	8	10	10	11	11	9	13	12	11	11	11	11	11	9	12	11	11	12	13	13	12	13	15	16	19	17	21	22	15	13	14	13	16
Density	113	114	121	119	110	104	114	96	99	109	110	111	111	113	126	119	128	130	113	105	86	100	99	96	90	60	78	77	72	87	103	97	84	95
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	4838	4725	4692	4654	4677	4676	5967	6025	6036	4980	5006	5034	5053	5035	5909	5941	6805	6828	6826	6760	6727	6250	6306	5665	5664	5631	5275	4724	4721	5361	4091	4126	4514	4480
Lanes	4	5	4	4	4	4	6	5	5	4	4	4	4	4	5	4	5	5	5	5	6	5	5	4	4	5	4	3	3	4	3	3	4	3
Length	1947	337	1171	633	2000	1610	531	843	1357	2000	2000	2000	1479	584	766	584	1112	2000	2000	725	763	636	665	872	672	820	1561	1090	527	1717	520	1157	771	687
LinkID	327	335	339	749	411	411	347	348	754	350	350	350	350	362	363	762	2430241	2430244	2430244	763	364	365	367	369	764	370	372	374	765	376	378	766	380	381
SegmentID	2	1	1	1	1	2	1	1	1	1	2	3	4	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

											Exit 18 MD 121																Exit 22 MD 109							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	14	18	20	20	20	21	20	20	17	12	12	12	13	13	15	28	45	50	50	50	50	51	51	50	50	50	53	53	53	52	52	53	53	52
Density	84	86	80	80	81	77	81	78	71	107	88	90	110	109	98	51	48	43	43	43	43	43	43	43	43	43	27	38	26	41	40	40	40	40
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	E	E	E	E	E	E	E	E	D	E	D	E	E	E	E	E
Volume	4674	4721	4755	4784	4792	4818	4790	4767	4775	3838	4287	4288	4254	4333	4321	4323	4318	4327	4312	4285	4330	4306	4305	4315	4328	4313	4319	4063	4188	4199	4199	4196	4194	4194
Lanes	4	3	3	3	3	3	3	3	4	3	4	4	3	3	3	3	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2
Length	457	1044	2000	2000	2000	2000	718	756	736	920	211	877	400	1727	2000	1731	2000	2000	905	482	2000	383	1176	2000	1202	1164	340	1049	452	1025	2000	2000	2000	2000
LinkID	383	384	767	767	767	767	767	768	385	387	389	1001	390	769	391	391	272	272	272	392	394	394	395	396	396	750	397	399	401	402	771	771	771	771
SegmentID	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	2	1	2	3	1	1	2	1	1	2	1	1	1	1	1	1	2	3	4

							Exit 26 MD 80																				Exit 31 MD 85				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	52	52	52	52	51	50	53	48	47	52	53	53	52	52	52	52	52	52	52	52	52	52	52	52	53	53	52	53	53	53
Density	40	40	40	40	40	41	27	33	29	44	41	40	40	40	40	40	40	40	40	40	40	40	41	41	40	26	37	25	34	25	24
LOS	E	E	E	E	E	E	D	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	D	E	C	D	C	C
Volume	4186	4193	4190	4201	4204	4190	4139	3486	4209	4197	4214	4214	4213	4216	4221	4201	4210	4171	4230	4228	4221	4220	4219	4217	4194	4207	3924	3873	3593	5219	5215
Lanes	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	4	4
Length	1502	2000	1497	2000	698	1279	214	773	615	868	2000	2000	2000	2000	1813	539	1225	391	2000	2000	2000	2000	2000	178	1025	473	1416	241	945	1115	392
LinkID	771	412	412	446	446	783	403	405	407	408	784	784	784	784	784	1010	1017	1007	869	869	869	869	869	869	785	415	417	421	423	425	577
SegmentID	5	1	2	1	2	1	1	1	1	1	1	2	3	4	5	1	1	1	1	2	3	4	5	6	1	1	1	1	1	1	1

2045 No-Build PM - I-270 SB Link Evaluation Results 4/25/2022

2045 No-Build PM
I-270 SB

					Exit 31																			Exit 26										
					MD 85																			MD 80										
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	56	57	56	57	58	56	58	55	59	62	63	63	63	63	63	63	62	61	59	58	56	56	55	57	59	56	53	54	56	57	56	56	56	56
Density	25	24	25	25	25	17	20	17	24	23	22	22	22	23	22	23	23	23	24	25	25	25	26	16	21	17	27	26	25	25	25	25	25	25
LOS	C	C	C	C	C	B	C	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B	C	B	D	D	C	C	C	C	C	C
Volume	4199	4186	4205	2836	2839	2818	2287	2826	2803	2814	2815	2826	2828	2842	2809	2830	2833	2840	2847	2846	2843	2837	2829	2812	2421	2827	2835	2832	2811	2820	2810	2746	2792	2797
Lanes	3	3	3	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2
Length	931	404	446	474	1052	294	849	378	1140	2000	2000	2000	2000	2000	262	2000	2000	2000	2000	2000	2000	548	1088	377	654	1399	88	1849	565	2000	2000	57	2000	2000
LinkID	683	2000012	157	2000014	699	2000016	2000017	2000020	2000021	703	703	703	703	703	703	448	448	448	448	448	448	448	704	201	2000022	2000025	2000026	705	447	455	455	455	453	453
SegmentID	1	1	1	1	1	1	1	1	1	1	2	3	4	5	6	1	2	3	4	5	6	7	1	1	1	1	1	1	1	1	2	3	1	2

🟥 🟧 🟨 🟩 🟩 **Speed Color Scale (mph)**

10 **30** **40** **50** **70**

					Exit 22																			Exit 18										
					MD 109																			MD 121										
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	55	55	55	55	56	57	57	55	56	56	56	56	56	55	56	55	55	55	54	58	61	61	62	60	62	62	63	63	63	63	63	63	63	63
Density	25	25	25	25	16	24	16	26	26	25	25	25	25	26	25	25	25	25	26	16	15	11	13	12	15	13	17	17	17	17	17	17	13	15
LOS	C	C	C	C	B	C	B	C	C	C	C	C	C	C	C	C	C	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
Volume	2787	2780	2766	2758	2753	2669	2830	2836	2837	2807	2802	2822	2826	2811	2832	2824	2812	2818	2814	2812	2811	2807	2431	2855	2856	3278	3278	3283	3294	3297	3292	3272	3274	2855
Lanes	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4	3	4	3	4	3	3	3	3	3	3	4	3
Length	2000	1801	1775	948	546	716	1665	130	2000	322	487	2000	475	658	2000	2000	856	2000	1724	624	766	708	839	828	553	1076	2000	2000	2000	2000	214	890	618	1871
LinkID	453	453	410	706	2000027	2000029	2000031	2000032	707	707	2000033	2000034	2000034	2000036	2000037	2000037	2000037	260	260	2000038	708	2000039	2000041	1002	2000044	709	2020578	2020578	2020578	2020578	2020578	710	2000045	2000047
SegmentID	3	4	1	1	1	1	1	1	1	2	1	1	2	1	1	2	3	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1

	Exit 16					Exit 15				Exit 13										Exit 11			Exit 10						Exit 9				Exit 8	
	MD 27					MD 118				Middlebrook Rd							Watkins Mill Rd			MD 124			MD 117						I-370				Shady Grove Rd	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	61	62	63	62	63	62	63	61	61	62	63	63	62	62	61	63	64	64	63	59	62	63	63	58	61	61	63	63	64	64	64	61	60	60
Density	14	19	15	16	17	14	19	17	23	22	22	20	21	21	21	16	14	14	17	18	22	21	21	24	23	23	19	18	15	15	15	16	20	20
LOS	B	C	B	B	B	B	C	B	C	C	C	C	C	C	C	B	B	B	B	C	C	C	C	C	C	C	C	C	B	B	B	B	C	C
Volume	3485	3471	3857	3858	3227	3571	3536	4159	4169	4182	4172	5128	5142	5119	5121	4144	3546	3520	4245	5392	5355	5400	5392	7038	7042	6943	7040	4627	4628	3871	3878	4795	4794	4793
Lanes	4	3	4	4	3	4	3	4	3	3	3	4	4	4	4	4	4	4	4	5	4	4	4	5	5	5	6	4	5	4	4	5	4	4
Length	684	1035	1007	1058	1713	543	751	500	1025	2000	723	1566	1324	2000	717	1147	1503	595	1131	838	658	2000	1062	1569	1151	431	1058	1258	1263	2000	1427	1046	420	497
LinkID	2000049	2000050	2000052	711	2000054	2000056	2000057	2000059	2000060	712	712	2000062	713	1026	1026	10040506	2000063	718	2000064	2000067	2000068	720	720	2000070	2000097	721	2000071	2000072	2000074	2000075	2000075	2000081	2000082	723
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1

						Exit 6						Exit 5					Exit 4											Exit 1						
						MD 28						MD 189					Montrose Rd						I-270 Spur				Westlake Terrace	Democracy Blvd						I-270 W Spur/I-495
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	60	61	61	61	60	60	60	60	59	60	60	60	59	59	61	61	61	61	61	59	59	59	60	60	59	58	59	59	59	57	56	56	33	14
Density	20	17	17	16	20	20	17	21	21	18	18	18	18	18	20	20	20	20	20	20	20	20	17	18	17	17	15	15	15	14	18	24	42	93
LOS	C	B	B	B	C	C	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B	C	B	B	B	B	B	B	C	C	E	F
Volume	4787	4138	4152	4824	4825	4820	5062	5065	5073	4401	4397	4402	4387	4395	5921	5938	5953	5937	5962	8237	8240	8192	8230	7714	3910	3915	4302	3444	3447	4081	4065	4099	4104	7586
Lanes	4	4	4	5	4	4	5	4	4	4	4	4	4	4	5	5	5	5	5	7	7	7	8	7	4	4	5	4	4	5	4	3	3	6
Length	1518	2000	1645	473	1022	1591	655	921	1515	2000	1237	1874	2000	1407	598	882	303	2000	1023	2000	1707	722	400	334	2000	999	962	2000	456	522	937	2000	520	554
LinkID	724	2000093	2000093	2000098	2000099	725	2000115	2000120	727	2000124	2000124	159	194	194	2000134	2000135	728	239	239	129	129	730	443	442	133	133	137	138	138	141	2020142	2115374	2115374	495375
SegmentID	1	1	2	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	2	1	2	1	1	1	1	2	1	1	2	1	1	1	2	1

2045 Preferred AM - I-495 OL Link Evaluation Results (GP) 4/25/2022

2045 Preferred AM
I-495 OL

									Exit 2			Exit 3									Exit 4													
	WWB								I-295			MD 210									MD 414													
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	54	57	56	56	57	58	59	59	58	58	58	59	59	59	59	58	59	59	59	59	58	59	59	53	53	46	31	23	20	16	16	14	16	14
Density	32	30	32	32	31	31	23	15	20	20	17	17	20	21	18	23	23	18	22	22	19	21	21	22	27	32	46	57	66	76	74	66	64	75
LOS	D	D	D	D	D	D	C	B	C	C	B	B	C	C	C	C	C	C	C	C	C	C	C	C	D	D	F	F	F	F	F	F	F	F
Volume	8619	8593	5377	5366	5372	5369	2685	2684	2323	2321	2941	2953	2356	4817	5337	5348	5334	5304	5143	5140	5466	5023	5017	5866	5731	5847	5626	5371	5135	4960	4853	4764	4225	4197
Lanes	5	5	3	3	3	3	2	3	2	2	3	3	2	4	5	4	4	5	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4
Length	2000	1268	2000	2000	2000	195	1182	890	2000	1282	2000	1297	1256	824	1314	1054	1042	448	914	495	674	410	694	1037	428	2000	2000	2000	2000	1655	912	602	729	508
LinkID	1	1	218503	218503	218503	218503	218507	218508	218509	218509	318105	318105	217308	217315	217316	971	972	217318	216105	973	216107	216110	974	216112	216115	979	979	979	979	979	980	216114	215901	981
SegmentID	1	2	1	2	3	4	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	

	Exit 7									Exit 9								Exit 11											Exit 13					
	MD 5									MD 337								MD 4											Ritchie Marlboro Rd					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	8	52	53	53	52	54	53	51	54	54	54	52	52	49	24	14	12	10	11	10	9	13	12	12	12	11	11	11	10	11	9	15	14	13
Density	108	20	19	18	22	22	22	23	19	19	19	20	25	26	54	89	100	106	111	115	127	111	126	126	126	128	127	106	133	132	136	108	115	115
LOS	F	C	C	B	C	C	C	C	C	C	C	C	C	D	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	4305	4114	4110	4689	4653	4726	4744	4757	4151	4177	4181	5155	5166	5133	5177	4794	4783	5269	4786	4779	5790	5836	5906	5883	5855	5853	5793	5850	5532	5553	6354	6378	6375	6221
Lanes	5	4	4	5	4	4	4	4	4	4	4	5	4	4	4	4	4	5	4	4	5	4	4	4	4	4	4	5	4	4	5	4	4	4
Length	1080	481	657	677	798	2000	773	1493	2000	2000	1594	706	788	515	1390	726	505	449	551	554	462	1023	2000	2000	2000	933	536	940	2000	518	1353	2000	1046	208
LinkID	215904	215905	982	215907	215908	983	983	984	214702	214702	214702	213501	213502	985	986	212301	992	212303	212305	1003	212307	212308	1004	1004	1004	1004	1005	212309	211206	211206	211212	1006	1006	1020
SegmentID	1	1	1	1	1	1	2	1	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	2	1	1	2	1

			Exit 15					Exit 16		Exit 17										Exit 19							Exit 20							
			MD 214					Arena Dr		MD 202										US 50							MD 450							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	12	10	9	13	11	11	17	11	34	26	21	10	12	14	38	55	56	59	57	58	58	58	58	58	56	55	56	56	32	35	56	58	59	56
Density	104	132	130	120	118	113	88	112	41	55	70	120	116	106	48	33	33	25	28	22	24	24	24	24	30	35	27	33	53	59	38	36	36	37
LOS	F	F	F	F	F	F	F	F	E	F	F	F	F	F	F	D	D	C	D	C	C	C	C	C	D	E	D	D	F	F	E	E	E	E
Volume	6339	5403	6121	6037	6548	6465	6010	6046	4228	4285	4342	7254	7216	7262	7239	7261	7253	7247	6414	6412	5577	5586	5589	8370	8406	7666	7567	7424	8390	8339	8397	8406	8406	8427
Lanes	5	4	5	4	5	5	4	5	3	3	3	6	5	5	4	4	4	5	4	5	4	4	4	6	5	4	5	4	5	4	4	4	4	4
Length	1288	1160	803	743	1378	1328	648	1500	2000	2000	1019	1002	499	722	2000	1520	793	705	785	562	2000	276	288	800	1391	716	276	949	1042	455	2000	2000	2000	1837
LinkID	211214	210903	210905	210906	210909	1022	209703	209704	209710	209710	209710	208515	208516	1023	326	326	1024	208518	207302	207303	207305	207305	1025	207306	207307	206101	206102	206104	206108	206109	1027	1027	1027	1027
SegmentID	1	1	1	1	1	1	1	1	1	2	3	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	3	4

					Exit 22						Exit 23					Exit 24						Exit 25						Exit 27						
					MD 295						MD 201					Greenbelt Metro Station						US 1						I-95						
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	58	54	53	51	50	52	51	50	51	33	21	13	20	24	46	35	50	55	55	57	56	29	16	12	8	8	8	9	9	7	8	8	9
Density	36	29	32	33	33	41	40	35	36	36	48	77	114	89	73	44	48	43	39	34	32	27	46	87	118	144	143	114	133	129	147	127	126	133
LOS	E	D	D	D	D	E	E	D	E	E	F	F	F	F	F	E	F	E	E	D	D	D	F	F	F	F	F	F	F	F	F	F	F	F
Volume	8408	8382	6922	6939	8340	8240	8260	8764	7333	7378	7885	7934	8693	8680	8699	8109	8531	8524	8538	7364	7332	7713	8194	8198	8228	4738	4705	4833	4886	4860	6237	6284	6253	5795
Lanes	4	5	4	4	5	4	4	5	4	4	5	5	6	5	5	4	5	4	4	4	4	5	6	6	6	4	4	5	4	4	6	6	6	5
Length	903	595	570	541	439	501	699	1815	589	828	434	995	471	993	1091	1922	1301	1225	1250	244	973	1149	1517	673	1486	2000	355	1017	490	825	1506	839	1513	814
LinkID	1029	206110	205903	1030	205905	205907	1031	205909	204704	1032	204706	204707	204709	204710	1033	2530009	203501	1034	1036	20020	202306	202308	202311	1035	1038	201103	201103	201104	201105	1039	201106	1040	1042	201107
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1

2045 Preferred AM

I-495 OL

		Exit 28										Exit 29				Exit 30									Exit 31									
		MD 650										MD 193				US 29									MD 97									
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	9	7	8	8	7	9	9	14	14	12	11	10	15	15	15	14	15	11	19	21	21	21	13	29	25	30	29	38	41	37	43	52	53	53
Density	133	142	142	139	150	134	141	109	107	96	124	133	105	103	103	91	106	123	91	86	86	86	107	57	59	62	58	55	51	55	48	40	31	31
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	D	D
Volume	5770	6079	5559	5553	5929	5972	6003	6007	5954	5970	5662	6347	6302	6341	6309	6448	6229	7080	7053	7118	7113	7094	7122	6607	7517	7422	8293	8240	8282	8238	8218	8207	6618	6589
Lanes	5	6	5	5	6	5	5	4	4	5	4	5	4	4	4	5	4	5	4	4	4	4	5	4	5	4	5	4	4	4	4	4	4	4
Length	509	450	501	284	347	1136	1629	1881	1185	301	793	713	805	1020	517	277	854	787	704	2000	832	1091	449	621	594	336	957	536	2000	2000	1795	1336	311	1657
LinkID	1043	7404	2000824	1046	7405	7409	1044	7407	1047	2000762	2000759	2000753	2000752	1049	1050	495302	495303	495304	495305	1051	1051	1053	7024	7026	7028	7029	7031	495316	1055	1055	1055	1056	1970012	495339
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	3	1	1	1

	Exit 33									Exit 34		Exit 35					Exit 36														Exit 39			
	MD 185									MD 355		I-270					MD 187							I-270 W Spur							MD 190			
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	53	52	52	48	48	52	52	53	53	53	49	53	53	53	53	53	53	53	52	53	53	53	52	52	25	46	52	53	53	52	53	53	53
Density	28	34	30	38	41	41	39	38	30	33	25	23	28	28	22	21	26	23	24	32	31	31	24	27	29	60	39	35	34	28	30	34	34	30
LOS	D	D	D	E	E	E	E	E	D	D	C	C	D	D	C	C	C	C	C	D	D	D	C	D	D	F	E	D	D	D	D	D	D	D
Volume	7273	7235	7987	7953	7982	7966	7974	7971	7953	6972	3988	4449	4450	4444	4696	4438	4077	3631	4965	4990	4993	4988	4952	4250	8929	8947	8949	8951	8935	8946	7754	7177	7169	7900
Lanes	5	4	5	4	4	4	4	4	5	4	3	4	3	3	4	4	3	3	4	3	3	3	4	3	6	6	5	5	5	6	5	4	4	5
Length	752	746	998	526	1257	2000	87	1045	402	1593	288	910	494	913	705	325	2000	22	406	1088	1128	2000	851	2000	242	621	2000	892	501	718	1081	2000	23	1594
LinkID	1953310	1953311	1953312	1953313	1058	1247	1247	1059	1248	1249	1251	1273	1276	1060	1061	1272	1275	1275	1274	495373	9000013	11205	1072	1071	495375	495392	1064	1064	1990208	495408	958	495406	1990205	495401
SegmentID	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1

					Exit 41	Bridge		Exit 43				Exit 44		
					Clara Barton Pkwy	American Legion		GW Memorial Pkwy				VA 193		
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	52	53	53	51	51	52	53	51	53	53	53	53	52
Density	38	37	37	30	37	28	33	32	35	28	31	26	23	28
LOS	E	E	E	D	E	D	D	D	E	D	D	D	C	D
Volume	7887	7837	7873	7797	7684	8539	8524	8501	7271	7230	6585	6926	7256	7242
Lanes	4	4	4	5	4	6	5	5	4	5	4	5	6	5
Length	1935	699	1108	401	1131	462	2000	453	1828	591	727	1322	853	873
LinkID	495415	2541707	1067	495416	495417	495418	809	1230	2530014	10600	10576	11517	11527	11562
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1

2045 Preferred AM - I-495 IL Link Evaluation Results (GP) 4/25/2022

2045 Preferred AM

I-495 IL

				Exit 44				Exit 43			Bridge		Exit 41								Exit 39													Exit 36
				VA 193				GW Memorial Pkwy			American Legion		Clara Barton Pkwy								MD 190							I-270 W Spur						MD 187
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	57	57	49	53	56	55	56	54	56	56	53	54	54	56	56	56	56	56	56	56	57	57	56	56	57	55	54	52	58	56	54	43	39	31
Density	28	28	33	34	32	30	29	32	31	31	33	37	38	29	37	37	37	37	29	33	26	26	24	30	29	30	31	30	24	24	34	41	34	47
LOS	D	D	D	D	D	D	D	D	D	D	D	E	E	D	E	E	E	E	D	D	D	D	C	D	D	D	D	D	C	C	D	E	D	F
Volume	8095	8100	8113	7171	7159	8156	8196	6952	6935	6943	8801	8087	8181	8300	8290	8278	8274	8234	8223	7466	7507	7500	8253	8249	8247	8236	8212	4643	5448	5441	5449	5325	5247	4434
Lanes	5	5	5	4	4	5	5	4	4	4	5	4	4	5	4	4	4	4	5	4	5	5	6	5	5	5	5	3	4	4	3	3	4	3
Length	2000	183	1499	2000	217	1019	1278	773	597	470	652	216	524	1414	697	502	851	1266	600	399	1267	530	798	922	1982	728	2000	1259	2000	525	2000	1173	305	2000
LinkID	11526	11526	11462	505836	505836	10572	1054	1080	1079	1113	1073	495412	1062	495413	1057	495414	2541704	1115	1293	495403	495404	1116	495405	495409	1117	495391	1118	495371	500	500	62	1119	1263	1270
SegmentID	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	30	40	50	70	

						Exit 34										Exit 33										Exit 31								
						MD 355										MD 185										MD 97								
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	27	27	29	28	29	30	27	27	27	24	41	51	54	47	54	55	59	59	58	56	52	58	60	60	60	57	58	58	59	59	59	59	59	59
Density	50	43	52	53	68	58	50	59	59	65	48	39	29	33	30	24	28	25	32	33	36	32	25	26	26	24	30	26	31	32	32	31	31	31
LOS	F	E	F	F	F	F	F	F	F	F	F	E	D	D	D	C	D	C	D	D	E	D	C	C	C	C	D	C	D	D	D	D	D	D
Volume	4004	4577	4573	4534	4019	6893	8000	7997	7956	7903	7847	7856	7853	7828	6467	6594	6576	7412	7415	7355	7410	7401	7399	6169	6139	6967	6996	7452	7370	7456	7436	7419	7312	7268
Lanes	3	4	3	3	2	4	6	5	5	5	4	4	5	5	4	5	4	5	4	4	4	4	5	4	4	5	4	5	4	4	4	4	4	4
Length	21	439	659	1113	1519	1951	513	1013	1002	521	1603	252	526	658	913	228	793	1635	2000	164	2000	1786	1941	10	942	411	323	1131	452	2000	1086	1248	248	500
LinkID	1270	1271	1257	1121	1258	1250	1260	1261	1120	1262	495331	1122	495332	2000004	495333	495334	495335	495336	495317	495317	2000003	2000003	7015	18877	7017	7019	7021	7023	1953113	1124	1124	1125	1990014	495307
SegmentID	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	2	1	1	1

	Exit 30					Exit 29										Exit 28							Exit 27						Exit 25					
	US 29					MD 193										MD 650							I-95						US 1					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	56	60	60	60	60	56	54	26	53	57	59	61	60	61	60	44	53	59	59	60	61	61	61	61	61	61	58	57	41	25	44	51	53	53
Density	26	27	27	24	27	25	33	57	36	33	32	31	25	30	30	35	34	31	28	28	21	21	17	22	22	24	21	27	37	57	40	35	33	27
LOS	C	D	D	C	D	C	D	F	E	D	D	D	C	D	D	E	D	D	D	D	C	C	B	C	C	C	C	D	E	F	E	D	D	D
Volume	7305	6550	6579	7120	6464	7100	7124	7535	7537	7514	7506	7485	7464	7147	7090	7794	7212	7228	8288	8262	5108	5126	5279	5293	5251	4471	6066	6088	6086	7134	7072	7092	6995	7043
Lanes	5	4	4	5	4	5	4	5	4	4	4	4	5	4	4	5	4	4	5	5	4	4	5	4	4	3	5	4	4	5	4	4	4	5
Length	260	499	524	1562	808	422	768	284	1222	2000	1072	1153	356	352	505	464	500	1046	1496	1493	1028	536	347	2000	140	1527	1473	2000	1605	670	846	626	481	1017
LinkID	495308	495309	1127	495295	2100087	2000197	2000764	2000770	2000771	1129	1129	1130	7410	2201100	1131	7412	101100	1132	101111	1128	101104	1138	101106	101107	101107	1137	101110	102301	102301	102312	102313	1135	1136	102314
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1

	Exit 24					Exit 23							Exit 22												Exit 20					Exit 19				
	Greenbelt Metro Station					MD 201							MD 295												MD 450					US 50				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	54	57	57	54	57	56	57	54	53	56	58	58	55	56	57	58	58	58	58	58	58	57	55	58	52	53	58	59	56	59	59	59	58	57
Density	30	24	24	25	24	21	26	23	29	22	22	22	23	26	25	20	25	25	25	25	25	25	20	22	24	30	22	22	18	19	19	21	25	31
LOS	D	C	C	C	C	C	C	C	D	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	C	C	C	C	C	C	C	D
Volume	6447	6777	6740	6764	5360	5854	5838	6222	6203	6218	5178	5179	6262	5725	5698	5774	5771	5768	5762	5759	5744	5700	5569	5125	6287	6261	6257	5167	5171	4534	4533	7231	7226	7210
Lanes	4	5	5	5	4	5	4	5	4	5	4	4	5	4	4	5	4	4	4	4	4	4	5	4	5	4	5	4	5	4	4	6	5	4
Length	2000	1540	1046	440	1150	761	810	740	938	452	520	566	554	497	516	779	711	2000	2000	2000	1629	1217	263	1109	984	561	1359	1371	213	2000	616	1434	754	2000
LinkID	103501	2530003	1139	103502	104704	104706	104707	104709	104710	104711	105902	1140	105904	105906	1141	105908	105909	1142	1142	1142	1142	1143	105910	106105	106108	106109	106110	107301	107302	107307	107307	107309	1144	107311
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	1	1	1	1	1	1	2	1	1	1

2045 Preferred AM

I-495 IL

	Exit 17						Exit 16					Exit 15							Exit 13										Exit 11					
	MD 202						Arena Dr					MD 214							Ritchie Marlboro Rd										MD 4					
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	59	60	59	59	59	59	60	59	60	58	59	60	60	58	60	60	60	61	61	60	60	60	59	59	54	58	61	57	59	58	48	43	39
Density	31	24	24	28	28	28	29	24	24	24	26	21	23	24	30	29	29	23	24	24	22	28	28	29	29	31	24	23	22	24	24	25	34	37
LOS	D	C	C	D	D	D	D	C	C	C	D	C	C	C	D	D	D	C	C	C	C	D	D	D	D	D	C	C	C	C	C	C	D	E
Volume	7155	7174	7203	5004	5025	5026	6782	7068	7068	7055	6170	6174	5577	7008	7002	6984	6902	6979	5944	5939	6713	6717	6750	6759	6754	6754	5643	5628	6210	5595	5603	5970	5889	5823
Lanes	4	5	5	3	3	3	4	5	5	5	4	5	4	5	4	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4
Length	190	855	1495	2000	2000	1908	1069	1470	249	1490	1056	692	986	1397	2000	796	480	997	2000	1072	1492	2000	2000	2000	772	1366	456	484	565	511	527	1147	344	1293
LinkID	107311	107312	1145	108500	108500	108500	109704	109707	1146	1148	110904	110905	110907	110913	1147	1147	1149	110915	111105	111105	111111	111112	111112	111112	111112	1150	112301	1151	112303	112305	1152	112307	112308	1153
SegmentID	2	1	1	1	2	3	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	2	3	4	1	1	1	1	1	1	1	1	1

				Exit 9									Exit 7													Exit 4								
				MD 337									MD 5													MD 414								
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	29	25	18	13	12	11	12	12	9	6	6	4	3	4	4	5	5	4	4	4	4	4	4	4	5	5	7	7	6	10	9	6	6	4
Density	49	44	69	89	100	89	101	99	127	139	152	182	182	180	172	168	171	172	173	170	173	172	139	170	149	124	115	113	113	93	95	143	106	163
LOS	F	E	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	5688	5597	4922	4765	4614	4796	4676	4626	4529	4448	4337	2609	2843	2843	3154	3182	3104	3059	2989	2984	2956	2926	2916	2847	2825	3368	3222	3206	3605	3603	3556	1799	1823	1464
Lanes	4	5	4	4	4	5	4	4	4	5	5	4	5	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4	5	4	4	2	3	2
Length	896	625	2000	2000	770	663	823	2000	727	761	1487	1134	789	706	691	807	2000	2000	2000	2000	670	860	617	1155	507	909	508	589	349	2000	55	1054	1707	1386
LinkID	1154	112309	113503	113503	113503	114701	114702	1155	1155	114703	1157	115905	115910	115911	115913	115914	1158	1158	1158	1158	1158	1159	115915	116102	1161	116104	116106	1162	116108	116109	116109	116110	116111	117305
SegmentID	1	1	1	2	3	1	1	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	1	2	1	1	1

	Exit 3						Exit 2							
	MD 210						I-295							WWB
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	5	7	8	11	13	14	16	42	56	57	58	57	49	57
Density	146	134	103	101	90	112	95	53	34	33	33	33	37	32
LOS	F	F	F	F	F	F	F	F	D	D	D	D	E	D
Volume	2938	2899	3464	3451	3448	3063	4497	4422	5733	5732	5732	5694	9067	9079
Lanes	4	3	4	3	3	2	3	2	3	3	3	3	5	5
Length	907	581	640	2000	598	1132	851	1030	2000	2000	2000	1329	2000	1262
LinkID	117307	117308	117310	117311	117311	118503	118504	118506	118508	118508	118508	118508	44	44
SegmentID	1	1	1	1	2	1	1	1	1	2	3	4	1	2

2045 Preferred AM - I-270 NB Link Evaluation Results (GP) 4/25/2022

2045 Preferred AM
I-270 NB

						Exit 1												**Exit 4**				**Exit 5**					**Exit 6**							**Exit 8**
		I-270 W Spur/I-495				**Democracy Blvd**		**Westlake Terrace**				**I-270 Spur**						**Montrose Rd**				**MD 189**					**MD 28**							**Shady Grove Rd**
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	54	61	62	62	63	63	64	63	64	62	63	64	64	63	64	64	63	62	63	59	60	61	61	59	59	59	59	60	59	60	59	59	59	59
Density	31	19	18	18	19	13	13	11	14	13	17	15	15	15	15	15	15	13	15	15	18	17	17	16	16	16	19	15	13	16	16	13	13	13
LOS	D	C	B	B	C	B	B	A	B	B	B	B	B	B	B	B	B	B	B	B	C	B	B	B	B	B	C	B	B	B	B	B	B	B
Volume	8212	3547	3319	3315	2386	2511	2508	2704	2702	3179	3179	5708	5696	5685	5666	5669	5643	4789	4653	5487	5497	5060	5066	5671	5645	5646	5473	4505	4743	4742	4701	4676	4687	3885
Lanes	5	3	3	3	2	3	3	4	3	4	3	6	6	6	6	6	6	6	5	6	5	5	5	6	6	6	5	5	6	5	5	6	6	5
Length	2000	1331	562	1024	575	939	286	1211	181	901	2000	1316	1029	2000	444	294	353	597	654	515	1253	155	804	965	460	533	537	842	661	483	1897	1160	428	859
LinkID	1118	2010261	276	232	234	235	237	134	241	242	243	274	275	738	739	280	2541643	428	742	289	1326	251	743	300	744	304	305	316	745	2541654	320	741	747	327
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	

				Exit 9						**Exit 10**		**Exit 11**											**Exit 13**				**Exit 15**						**Exit 16**	
				I-370						**MD 117**		**MD 124**			**Watkins Mill Rd**								**Middlebrook Rd**				**MD 118**						**MD 27**	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	58	57	58	58	57	57	58	58	59	59	59	59	59	59	59	59	60	60	60	60	60	59	59	59	59	58	58	59	59	59	60	59	59
Density	12	13	12	19	16	17	14	17	17	15	15	15	15	15	14	17	16	15	15	15	13	14	14	17	16	13	16	18	18	16	17	17	14	18
LOS	B	B	B	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	B	B	B	B	C
Volume	4111	4387	3482	3221	3778	3766	4868	4889	4882	3578	3575	3566	3570	3559	4006	4045	4607	4609	4599	4557	4570	4155	4207	3919	3883	3884	3632	3210	3214	3711	3087	3105	3288	3263
Lanes	6	6	5	3	4	4	6	5	5	4	4	4	4	4	5	4	5	5	5	5	6	5	5	4	4	5	4	3	3	4	3	3	4	3
Length	746	619	478	1321	1545	1978	531	843	1357	2000	2000	2000	1479	584	775	577	1112	2000	2000	725	763	636	672	865	676	821	1564	1084	521	1716	520	1157	771	687
LinkID	146	335	339	749	411	2541578	347	348	754	350	350	350	350	362	363	762	2430241	2430244	2430244	763	364	365	367	369	764	370	372	374	765	376	378	766	380	381
SegmentID	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

											Exit 18																**Exit 22**							
											MD 121																**MD 109**							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	59	59	60	59	59	59	59	59	55	59	57	59	60	60	60	57	57	57	57	57	57	56	57	56	56	56	56	57	57	56	56	56	56	56
Density	14	19	19	19	19	19	19	19	15	14	14	13	17	17	17	18	27	27	27	27	27	27	27	27	27	27	18	25	17	26	26	27	27	26
LOS	B	C	C	C	C	C	C	C	B	B	B	B	B	B	B	C	D	D	D	D	D	D	D	D	D	D	C	C	B	D	D	D	D	D
Volume	3376	3396	3399	3394	3398	3386	3383	3376	3371	2496	3088	3097	3086	3117	3109	3099	3083	3087	3067	3049	3073	3056	3058	3053	3062	3053	3058	2909	2962	2964	2956	2967	2967	2942
Lanes	4	3	3	3	3	3	3	3	4	3	4	4	3	3	3	3	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2
Length	457	1044	2000	2000	2000	2000	718	756	736	920	211	877	400	1727	2000	1731	2000	2000	905	482	2000	383	1176	2000	1202	1164	340	1049	451	1025	2000	2000	2000	2000
LinkID	383	384	767	767	767	767	767	768	385	387	389	1001	390	769	391	391	272	272	272	392	394	394	395	396	396	750	397	399	401	402	771	771	771	771
SegmentID	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	2	1	2	3	1	1	2	1	1	2	1	1	1	1	1	1	2	3	4

							Exit 26																				**Exit 31**				
							MD 80																				**MD 85**				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	55	55	55	55	55	54	50	55	49	51	58	62	62	63	63	63	63	63	63	63	63	63	62	62	62	62	62	58	63	61	63
Density	27	27	26	26	26	27	19	23	21	31	27	25	25	25	25	25	25	25	25	25	25	25	25	25	25	17	24	17	19	15	14
LOS	D	D	D	D	D	D	C	C	C	D	D	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B	C	B	C	B	B
Volume	2929	2930	2905	2900	2885	2866	2823	2563	3133	3120	3136	3126	3138	3157	3167	3149	3150	3117	3153	3130	3122	3136	3132	3133	3115	3132	2933	2890	2428	3534	3538
Lanes	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	4	4
Length	1502	2000	1497	2000	698	1279	214	773	615	868	2000	2000	2000	2000	1813	539	1225	391	2000	2000	2000	2000	2000	178	1025	473	1416	241	945	1115	392
LinkID	771	412	412	446	446	783	403	405	407	408	784	784	784	784	784	1010	1017	1007	869	869	869	869	869	869	785	415	417	421	423	425	577
SegmentID	5	1	2	1	2	1	1	1	1	1	1	2	3	4	5	1	1	1	1	2	3	4	5	6	1	1	1	1	1	1	1

2045 Preferred AM - I-270 SB Link Evaluation Results (GP) 4/25/2022

2045 Preferred AM
I-270 SB

					Exit 31												
					MD 85												
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	11	11	11	9	9	8	7	7	15	15	15	15	15	15	15	15	15
Density	110	113	113	140	140	98	147	144	100	98	98	98	98	98	96	96	96
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	3615	3626	3610	2479	2490	2480	2179	2978	2941	2954	2964	2960	2951	2944	2946	2931	2947
Lanes	3	3	3	2	2	3	2	3	2	2	2	2	2	2	2	2	2
Length	931	379	446	474	1052	294	849	378	1140	2000	2000	2000	2000	2000	262	2000	2000
LinkID	683	2000012	157	2000014	699	2000016	2000017	2000020	2000021	703	703	703	703	703	703	448	448
SegmentID	1	1	1	1	1	1	1	1	1	1	2	3	4	5	6	1	2

							Exit 26										
							MD 80										
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	15	15	15	15	16	15	12	13	15	19	28	30	29	27	27	25	25
Density	97	97	95	96	95	97	79	108	84	97	66	61	64	67	64	70	72
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	2926	2926	2928	2940	2949	2930	2930	2737	3693	3705	3690	3666	3676	3649	3538	3558	3528
Lanes	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2
Length	2000	2000	2000	2000	548	1088	376	651	1400	110	1849	565	2000	2000	57	2000	2000
LinkID	448	448	448	448	448	704	201	2000022	2000025	2000026	705	447	455	455	455	453	453
SegmentID	3	4	5	6	7	1	1	1	1	1	1	1	1	2	3	1	2

Speed Color Scale (mph)

🟥	🟧	🟨	🟩	🟩
10	30	40	50	70

					Exit 22												
					MD 109												
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	24	23	23	23	22	22	20	22	30	33	33	33	34	33	33	32	31
Density	73	75	74	76	52	77	67	88	66	60	59	59	58	60	60	61	63
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	3478	3455	3461	3444	3445	3431	3933	3855	3920	3888	3874	3907	3908	3882	3904	3901	3885
Lanes	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2
Length	2000	1801	1775	948	546	716	1664	92	2000	406	487	2000	475	658	2000	2000	856
LinkID	453	453	410	706	2000027	2000029	2000031	2000032	707	707	2000033	2000034	2000034	2000036	2000037	2000037	2000037
SegmentID	3	4	1	1	1	1	1	1	1	2	1	1	2	1	1	2	3

							Exit 18										
							MD 121										
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	31	31	23	13	10	8	8	10	10	12	13	13	14	14	13	11	9
Density	63	62	57	95	90	129	133	132	107	124	123	117	113	115	117	103	139
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	3890	3867	3826	3773	3711	3244	4046	3970	4510	4528	4613	4665	4690	4716	4695	4699	3744
Lanes	2	2	3	3	4	3	4	3	4	3	3	3	3	3	3	4	3
Length	2000	1724	624	766	708	839	828	553	1076	2000	2000	2000	2000	214	890	618	1871
LinkID	260	260	2000038	708	2000039	2000041	1002	2000044	709	2020578	2020578	2020578	2020578	2020578	710	2000045	2000047
SegmentID	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1

	Exit 16					Exit 15				Exit 13							
	MD 27					MD 118				Middlebrook Rd							Watkins Mill Rd
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	9	13	12	13	14	15	16	16	29	32	30	28	32	32	27	19	13
Density	131	118	109	104	115	89	108	87	67	60	65	67	58	59	69	87	105
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	4698	4689	5310	5310	4836	5179	5118	5731	5736	5734	5717	7499	7494	7434	7399	6494	5689
Lanes	4	3	4	4	3	4	3	4	3	3	3	4	4	4	4	4	4
Length	684	1035	1007	1058	1713	543	751	500	1025	2000	719	1566	1324	2000	704	1092	1581
LinkID	2000049	2000050	2000052	711	2000054	2000056	2000057	2000059	2000060	712	712	2000062	713	1026	1026	2531003	2000063
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1

			Exit 11			Exit 10						Exit 9				Exit 8	
			MD 124			MD 117						I-370				Shady Grove Rd	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	13	19	18	22	21	21	25	40	50	51	50	53	53	53	52	53	52
Density	107	92	86	89	92	93	79	41	32	32	31	36	29	23	27	27	24
LOS	F	F	F	F	F	F	F	E	D	D	D	E	D	C	D	D	C
Volume	5729	6851	7899	7854	7915	7937	9719	9742	9768	9747	9293	7570	6117	8373	8381	7063	7556
Lanes	4	4	5	4	4	4	5	6	6	6	6	4	4	7	6	5	6
Length	593	1122	838	658	2000	1062	1569	1152	430	928	38	1043	183	703	1673	510	1027
LinkID	718	2000064	2000067	2000068	720	720	2000070	2000097	721	2000071	2000072	2000074	2000075	2541660	2000081	2000082	723
SegmentID	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1

						Exit 6						Exit 5					Exit 4
						MD 28						MD 189					Montrose Rd
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	52	53	53	53	53	54	53	53	52	52	53	44	44	49	53	48
Density	29	30	30	30	30	30	25	29	25	29	28	31	36	42	37	35	35
LOS	D	D	D	D	D	D	C	D	C	D	D	D	E	E	E	E	E
Volume	7555	7890	7903	7926	7883	7850	7908	7597	7809	8965	8936	8249	9378	9385	9268	9230	10171
Lanes	5	5	5	5	5	5	6	5	6	6	6	5	6	5	5	5	6
Length	209	2000	2000	458	982	396	526	1448	272	2000	487	2000	717	1028	198	880	644
LinkID	724	2000093	2000093	2000098	2000099	725	2000115	2000120	727	2000124	2541718	159	194	1354	1362	2000135	728
SegmentID	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1

											Exit 1						
						I-270 Spur				Westlake Terrace	Democracy Blvd						I-270 W Spur/I-495
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	39	20	22	29	49	52	52	53	53	53	53	53	63	53	53	53	52
Density	48	84	75	57	33	31	31	23	23	23	23	22	21	30	30	30	29
LOS	F	F	F	F	D	D	D	C	C	C	C	C	C	D	D	D	D
Volume	9350	9922	9814	9698	9650	9625	9678	4909	4919	4930	4820	4696	2658	4697	4700	4709	8929
Lanes	5	6	6	6	6	6	6	4	4	4	4	4	2	3	3	3	6
Length	806	1055	2000	1754	663	605	416	2000	632	1205	1103	705	2000	16	1692	29	242
LinkID	239	2541712	129	129	730	443	442	133	133	137	138	1061	4	11682	2115374	10519	495375
SegmentID	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1

2045 Preferred AM - I-495 IL Link Evaluation Results (HOT) 4/25/2022

				Exit 44			Exit 43			Bridge		Exit 41								Exit 40		Exit 39								
				VA 193			GW Memorial Pkwy			American Legion		Clara Barton Pkwy								Cabin John Pkwy		MD 190				I-270 West Spur				
	Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
2045 Preferred AM **I-495 IL ETL**	**Speed**	64	64	64	63	63	64	64	63	63	63	63	63	63	63	63	63	63	63	63	63	64	63	64	63	62	61	61	57	58
	Density	15	15	15	15	10	13	13	13	13	19	19	19	19	19	19	19	19	19	19	12	12	13	13	13	13	13	13	14	14
	LOS	B	B	B	B	A	B	B	B	B	C	C	C	C	C	C	C	C	C	C	B	B	B	B	B	B	B	B	B	B
	Volume	1918	1916	1914	1914	1914	1692	1682	1690	2395	2402	2398	2392	2401	2389	2390	2394	2395	2396	2399	2316	2316	2481	2483	2469	2460	811	811	815	816
	Lanes	2	2	2	2	3	2	2	2	3	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	1	1	1	1
	Length	2000	1496	2000	928	812	2000	524	1327	1243	2000	810	207	1459	255	162	269	18	2000	593	1003	1020	337	2000	1394	500	2000	2000	745	37
	LinkID	20929	20927	495419	2551682	10579	2541432	2541432	2540002	2540004	1227	1227	950	2540006	2540007	2540009	807	11439	2541689	2541689	1377	2540021	2541610	2541612	2541612	805	2540025	2540025	2540033	10529
	SegmentID	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	

2045 Preferred AM - I-495 OL Link Evaluation Results (HOT) **4/25/2022**

2045 Preferred AM
I-495 OL ETL

										Exit 39			Exit 40		
				I-270 West Spur						MD 190			Cabin John Pkwy		
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	58	60	56	56	63	63	63	63	63	63	63	63	63	63	63
Density	12	12	13	13	11	18	18	18	13	16	16	19	21	21	21
LOS	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**C**	**C**	**C**	**C**
Volume	710	710	709	709	708	3366	3373	3371	3367	3038	3034	2381	2611	2613	2611
Lanes	1	1	1	1	1	3	3	3	4	3	3	2	2	2	2
Length	713	33	1676	1676	887	702	2000	1452	589	1249	509	935	627	1376	298
LinkID	1096	2540036	2540024	2540024	1386	2540022	2541714	2541714	967	966	189	2540019	1295	1296	954
SegmentID	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1

						Exit 41		Bridge			Exit 43			Exit 44	
						Clara Barton Pkwy		American Legion			GW Memorial Pkwy			VA 193	
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	63	63	63	63	63	63	63	62	61	63	64	64	62	63	63
Density	21	21	21	21	21	21	21	21	21	14	13	13	10	15	15
LOS	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**B**	**B**	**B**	**A**	**B**	**B**
Volume	2612	2611	2611	2611	2611	2615	2618	2604	2612	1696	1692	1909	1921	1937	1945
Lanes	2	2	2	2	2	2	2	2	3	2	2	3	2	2	2
Length	580	905	733	540	2000	1680	1070	572	697	2000	891	303	787	2000	873
LinkID	2541683	2540017	2540010	951	2541700	2541700	1212	1237	949	334	334	10593	20920	20922	20924
SegmentID	1	1	1	1	1	2	1	1	1	1	2	1	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	

2045 Preferred AM - I-270 NB Link Evaluation Results (HOT) 4/25/2022

2045 Preferred AM
I-270 NB ETL

	I-270 West Spur/I-495				Exit 1 Democracy Blvd		Westlake Terrace			I-270 Spur							Exit 4 Montrose Rd			
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	63	64	63	63	64	64	59	62	63	64	64	64	64	64	64	64	64	63	62	64
Density	13	13	13	9	11	8	9	9	7	10	10	8	12	12	12	12	12	12	12	9
LOS	**B**	**B**	**B**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**A**
Volume	1652	1651	1648	1646	1373	1597	1591	1103	1280	1281	1281	1577	1572	1565	1557	1551	1551	1551	1553	1174
Lanes	2	2	2	3	2	3	3	2	3	2	2	3	2	2	2	2	2	2	2	2
Length	2000	2000	1009	655	379	1081	954	916	702	2000	180	1150	2000	1571	1509	485	1076	616	592	2000
LinkID	2540027	2540027	2541361	331	148	333	329	2541631	803	2541633	2541633	2541365	2541364	2541364	2541381	2541383	2541373	2541393	2541399	10498
SegmentID	1	2	1	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1

			Exit 5 MD 189							Exit 6 MD 28					Exit 8 Shady Grove Rd				Exit 9 I-370	
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	64	63	63	63	63	63	63	63	63	61	57	64	64	63	64	63	63	64	64	64
Density	9	7	11	11	11	11	11	11	11	11	8	6	6	5	7	7	8	9	9	9
LOS	**A**	**A**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
Volume	1170	1418	1421	1420	1412	1412	1413	1417	1411	1397	1400	751	752	939	949	948	953	555	556	558
Lanes	2	3	2	2	2	2	2	2	2	2	3	2	2	3	2	2	2	1	1	1
Length	1248	504	2000	1966	1820	270	848	2000	1041	347	300	2000	1378	504	2000	258	1040	2000	1066	619
LinkID	10498	804	145	145	2541341	2541347	2541345	2541338	2541338	2541335	130	136	136	802	2541327	2541327	2541324	2541321	2541321	2541722
SegmentID	2	1	1	2	1	1	1	1	2	1	1	1	2	1	1	2	1	1	2	1

Speed Color Scale (mph)

🟥	🟧	🟨	🟩	🟩
10	**30**	**40**	**50**	**70**

2045 Preferred AM - I-270 SB Link Evaluation Results (HOT) **4/25/2022**

2045 Preferred AM
I-270 SB ETL

	Exit 9				Exit 8									Exit 6				Exit 5						Exit 4											Exit 1				
	I-370				Shady Grove Rd									MD 28				MD 189						Montrose Rd						I-270 Spur			Westlake Terrace		Democracy Blvd			I-270 West Spur/I-495	
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	49	55	56	61	63	63	63	62	63	63	56	61	63	63	63	63	63	63	58	63	63	62	62	62	63	63	63	63	63	63	63	63	63	63	63	63	63	62	62
Density	28	25	25	19	19	19	19	13	16	16	16	22	21	21	21	21	21	21	15	18	18	15	23	22	22	22	22	22	15	18	12	15	15	14	11	16	21	14	14
LOS	D	C	C	C	C	C	C	B	B	B	B	C	C	C	C	C	C	C	B	C	C	B	C	C	C	C	C	C	B	C	B	B	B	B	A	B	C	B	B
Volume	1394	1393	1395	2356	2349	2351	2356	2348	2067	2075	2661	2656	2664	2661	2667	2664	2664	2662	2662	2304	2315	2777	2784	2784	2787	2778	2773	2772	2766	2300	2300	1921	1921	1715	2035	2037	2658	2657	2657
Lanes	1	1	1	2	2	2	2	3	2	2	3	2	2	2	2	2	2	2	3	2	2	3	2	2	2	2	2	2	3	2	3	2	2	2	3	2	2	3	3
Length	834	302	2000	703	2000	364	134	405	2000	1730	363	2000	1064	794	470	1684	2000	1871	293	2000	1349	875	742	1144	420	1516	2000	2000	1050	1266	709	851	1013	628	724	1677	2000	972	972
LinkID	2541720	2541308	2541322	800	2541326	2541326	2541330	93	131	131	2541334	2541589	2541589	2541339	2541343	2541349	2541351	2541351	147	151	151	144	2541394	2541374	2541377	2541378	2541363	2541363	2541366	2541362	1066	2541636	325	328	806	332	4	2540026	2540026
SegmentID	1	1	1	1	1	2	1	1	1	2	1	1	2	1	1	1	1	2	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	

2045 Preferred PM - I-495 OL Link Evaluation Results (GP) **4/25/2022**

2045 Preferred PM

I-495 OL

									Exit 2			Exit 3									Exit 4													
	WWB								I-295			MD 210									MD 414													
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	20	24	53	55	57	57	58	58	58	58	56	57	58	58	55	52	57	57	58	58	57	58	58	53	53	53	53	53	52	52	52	53	53	53
Density	97	79	33	32	31	30	31	21	26	26	27	27	30	29	28	37	34	27	29	29	24	27	27	25	31	31	31	32	32	32	32	25	25	25
LOS	F	F	D	D	D	D	D	C	C	C	D	D	D	D	D	E	D	D	D	D	C	D	D	C	D	D	D	D	D	D	D	C	C	C
Volume	9640	9648	5255	5248	5235	5234	3654	3651	2967	2959	4580	4589	3432	6785	7694	7710	7691	7643	6709	6715	6947	6261	6251	6635	6494	6665	6665	6674	6679	6686	6663	6628	5340	5334
Lanes	5	5	3	3	3	3	2	3	2	2	3	3	2	4	5	4	4	5	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4
Length	2000	2000	2000	2000	2000	195	1182	890	2000	1282	2000	1297	1256	824	1314	1054	1042	448	914	495	674	410	694	1037	428	2000	2000	2000	2000	1655	912	602	729	508
LinkID	1	1	218503	218503	218503	218503	218507	218508	218509	218509	318105	318105	217308	217315	217316	971	972	217318	216105	973	216107	216110	974	216112	216115	979	979	979	979	979	980	216114	215901	981
SegmentID	1	2	1	2	3	4	1	1	1	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1

Speed Color Scale (mph)

10	30	40	50	70

	Exit 7									Exit 9								Exit 11											Exit 13					
	MD 5									MD 337								MD 4											Ritchie Marlboro Rd					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	53	52	53	40	34	27	22	20	18	17	17	18	43	51	51	53	53	51	52	52	53	51	52	52	48	45	41	37	31	27	24	34	31	27
Density	23	28	28	35	50	64	78	84	89	92	91	82	43	37	37	31	31	29	32	32	29	38	37	37	40	43	46	41	55	62	62	55	60	68
LOS	C	D	D	D	F	F	F	F	F	F	F	F	E	E	E	D	D	D	D	D	D	E	E	E	E	E	F	E	F	F	F	F	F	F
Volume	6083	5786	5780	6865	6790	6837	6762	6751	6261	6289	6273	7457	7485	7437	7491	6561	6543	7386	6638	6632	7711	7692	7718	7725	7692	7659	7577	7603	6827	6768	7586	7516	7425	7236
Lanes	5	4	4	5	4	4	4	4	4	4	4	5	4	4	4	4	4	5	4	4	5	4	4	4	4	4	4	5	4	4	5	4	4	4
Length	1080	481	657	677	798	2000	773	1493	2000	2000	1594	706	788	515	1390	726	505	449	551	554	462	1023	2000	2000	2000	933	536	940	2000	518	1353	2000	1046	208
LinkID	215904	215905	982	215907	215908	983	983	984	214702	214702	214702	213501	213502	985	986	212301	992	212303	212305	1003	212307	212308	1004	1004	1004	1004	1005	212309	211206	211206	211212	1006	1006	1020
SegmentID	1	1	1	1	1	1	2	1	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	2	1	1	2	1

			Exit 15					Exit 16		Exit 17										Exit 19							Exit 20							
			MD 214					Arena Dr		MD 202										US 50							MD 450							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	19	12	12	16	13	15	18	19	17	17	17	11	16	18	25	40	45	52	57	58	58	58	58	58	50	37	29	24	19	22	23	20	17	16
Density	79	122	113	107	106	96	95	71	105	106	106	112	94	83	76	47	42	29	25	20	22	22	22	20	29	42	42	61	69	74	72	82	93	97
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	D	C	C	C	C	C	C	D	E	E	F	F	F	F	F	F	F
Volume	7330	5800	6797	6714	7137	7107	6684	6747	5227	5243	5252	7494	7464	7497	7489	7505	7489	7481	5747	5751	5044	5049	5027	7097	7216	6231	6115	5786	6618	6502	6496	6429	6358	6307
Lanes	5	4	5	4	5	5	4	5	3	3	3	6	5	5	4	4	4	5	4	5	4	4	4	6	5	4	5	4	5	4	4	4	4	4
Length	1288	1160	803	743	1378	1328	648	1500	2000	2000	1020	1002	499	722	2000	1520	793	705	785	562	2000	276	520	571	1391	716	276	949	1042	455	2000	2000	2000	1837
LinkID	211214	210903	210905	210906	210909	1022	209703	209704	209710	209710	209710	208515	208516	1023	326	326	1024	208518	207302	207303	207305	207305	1025	207306	207307	206101	206102	206104	206108	206109	1027	1027	1027	1027
SegmentID	1	1	1	1	1	1	1	1	1	2	3	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	3	4

					Exit 22						Exit 23					Exit 24						Exit 25						Exit 27						
					MD 295						MD 201					Greenbelt Metro Station						US 1						I-95						
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	16	12	11	11	11	16	18	14	16	17	13	14	13	18	22	48	56	53	44	50	56	57	56	57	46	56	58	58	58	58	53	53	53	53
Density	98	103	123	118	123	99	93	100	102	95	116	108	110	93	74	40	31	41	49	40	35	30	28	28	34	23	22	18	23	22	24	24	24	26
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	D	E	F	E	E	D	D	D	D	C	C	B	C	C	C	C	C	C
Volume	6291	6232	5277	5295	6551	6489	6531	7144	6457	6484	7419	7459	8284	8247	8276	7837	8719	8740	8694	7926	7883	8484	9356	9360	9368	5208	5162	5224	5265	5239	7632	7642	7609	6889
Lanes	4	5	4	4	5	4	4	5	4	4	5	5	6	5	5	4	5	4	4	4	4	5	6	6	6	4	4	5	4	4	6	6	6	5
Length	903	595	570	541	439	501	699	1815	589	828	434	995	471	993	1104	1978	1301	1225	1250	244	973	1149	1517	673	1486	2000	355	1017	490	825	1506	839	1513	814
LinkID	1029	206110	205903	1030	205905	205907	1031	205909	204704	1032	204706	204707	204709	204710	1033	2530009	203501	1034	1036	20020	202306	202308	202311	1035	1038	201103	201103	201104	201105	1039	201106	1040	1042	201107
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1

2045 Preferred PM

I-495 OL

		Exit 28										Exit 29				Exit 30									Exit 31									
		MD 650										MD 193				US 29									MD 97									
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	53	52	53	53	52	53	50	50	52	53	53	52	51	53	53	53	50	37	44	50	52	52	53	53	51	50	51	47	50	50	51	52	50	43
Density	26	23	25	25	23	28	29	36	34	27	30	27	34	34	33	28	34	42	44	39	37	37	29	31	29	37	31	42	40	40	39	39	34	40
LOS	C	C	C	C	C	D	D	E	D	D	D	D	D	D	D	D	D	E	E	E	E	E	D	D	D	E	D	E	E	E	E	E	D	E
Volume	6857	7303	6614	6609	7245	7263	7260	7254	7215	7226	6379	7027	6984	7050	7034	7272	6894	7756	7753	7792	7802	7772	7803	6486	7499	7425	7944	7919	7956	7947	7950	7957	6812	6821
Lanes	5	6	5	5	6	5	5	4	4	5	4	5	4	4	4	5	4	5	4	4	4	4	5	4	5	4	5	4	4	4	4	4	4	4
Length	509	450	501	284	347	1136	1629	1881	1185	301	793	713	805	1020	517	277	854	787	704	2000	832	1091	449	719	500	336	957	536	2000	2000	1795	1336	311	1657
LinkID	1043	7404	2000824	1046	7405	7409	1044	7407	1047	2000762	2000759	2000753	2000752	1049	1050	495302	495303	495304	495305	1051	1051	1053	7024	7026	7028	7029	7031	495316	1055	1055	1055	1056	1970012	495339
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	2	3	1	1	1

	Exit 33									Exit 34		Exit 35					Exit 36														Exit 39			
	MD 185									MD 355		I-270					MD 187						I-270 W Spur								MD 190			
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	35	35	31	31	36	44	50	51	52	53	53	49	53	53	53	53	53	53	53	52	53	43	52	53	54	54	53	53	53	52	53	53	53	53
Density	44	55	53	65	58	48	41	41	32	34	25	22	27	27	27	21	25	22	22	29	29	14	27	27	22	22	27	27	27	23	24	30	26	32
LOS	E	F	F	F	F	F	E	E	D	D	C	C	D	D	D	C	C	C	C	D	D	B	D	D	C	C	D	D	D	C	C	D	C	D
Volume	7623	7618	8219	8199	8259	8286	8302	8295	8276	7169	3910	4350	4360	4360	4357	4367	4008	3575	4621	4631	4638	2372	4238	4240	7108	7144	7126	7131	7107	7067	6470	6323	6820	6830
Lanes	5	4	5	4	4	4	4	4	5	4	3	4	3	3	3	4	3	3	4	3	3	4	3	3	6	6	5	5	5	6	5	4	5	4
Length	752	746	998	526	1257	2000	87	1045	402	1593	288	910	494	913	1192	325	2000	22	406	1079	2000	718	2000	789	239	620	2000	914	490	138	1092	2000	1597	457
LinkID	1953310	1953311	1953312	1953313	1058	1247	1247	1059	1248	1249	1251	1273	1276	1060	1061	1272	1275	1275	1274	495373	9000013	961	967	967	495375	495392	1064	1064	1066	495408	12687	507135	507130	12685
SegmentID	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1

					Exit 41	Bridge		Exit 43				Exit 44		
					Clara Barton Pkwy	American Legion		GW Memorial Pkwy				VA 193		
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	53	53	53	52	50	50	52	50	52	53	53	54	53	53
Density	32	32	32	26	34	28	32	33	33	26	29	27	24	29
LOS	D	D	D	D	D	D	D	D	D	C	D	D	C	D
Volume	6816	6835	6831	6790	6779	8280	8358	8320	6892	6873	6177	7130	7790	7783
Lanes	4	4	4	5	4	6	5	5	4	5	4	5	6	5
Length	2000	230	1881	405	1073	459	2000	717	1851	593	728	1316	842	613
LinkID	495415	2541579	1067	951	495417	495418	11865	11885	2540313	10567	1083	1084	1101	1114
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1

2045 Preferred PM - I-495 IL Link Evaluation Results(GP) 4/25/2022

2045 Preferred PM
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				Exit 44				Exit 43			Bridge		Exit 41								Exit 39													Exit 36
				VA 193				GW Memorial Pkwy			American Legion		Clara Barton Pkwy								MD 190							I-270 W Spur						MD 187
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	59	58	58	59	59	56	57	55	55	54	55	49	44	29	26	21	18	14	11	10	9	8	8	9	8	7	7	5	6	6	7	6	6	5
Density	15	15	15	16	16	15	22	22	22	24	24	27	30	36	50	59	68	81	77	104	110	120	120	122	128	136	139	168	128	123	154	158	125	168
LOS	B	B	B	B	B	B	C	C	C	C	C	D	D	E	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	4272	4266	4266	3828	3832	5077	4917	4954	4938	6504	6527	5320	5259	5247	5106	4891	4801	4604	4363	4079	4751	4634	5448	5264	5057	4876	4749	2646	3191	3143	3110	3048	3008	2634
Lanes	5	5	5	4	4	6	4	4	4	5	5	4	4	5	4	4	4	4	5	4	5	5	6	5	5	5	5	3	4	4	3	3	4	3
Length	2000	1468	1468	2000	206	354	386	965	527	366	2000	107	652	1411	204	530	2000	2000	1109	1071	1281	552	806	908	2000	694	2000	1210	2000	526	2000	1173	305	2000
LinkID	1100	1037	1037	495411	495411	1089	11879	11878	11883	11869	2540311	495412	1062	495413	1057	495414	2541577	2541577	13022	1294	507133	12845	507134	495409	1117	495391	1118	495371	190	190	10000	1119	11263	1270
SegmentID	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1

🟥	🟧	🟨	🟩	🟩	
10	30	40	50	70	Speed Color Scale (mph)

						Exit 34										Exit 33										Exit 31								
						MD 355										MD 185										MD 97								
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	6	6	6	8	10	12	13	16	15	16	17	17	15	15	13	13	14	15	23	24	24	23	24	21	17	16	20	21	23	30	29	28	26	25
Density	129	129	148	126	129	119	90	91	92	89	100	102	90	93	113	100	111	102	83	81	83	87	66	83	99	96	95	76	85	68	71	74	78	79
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	2891	2891	2892	2893	2653	5847	7054	7107	7069	7017	7002	6984	6965	6963	6109	6277	6250	7806	7808	7759	7834	7852	7814	6950	6913	7628	7644	8140	8015	8163	8210	8220	8044	7999
Lanes	4	4	3	3	2	4	6	5	5	5	4	4	5	5	4	5	4	5	4	4	4	4	5	4	4	5	4	5	4	4	4	4	4	4
Length	439	439	659	1113	1519	1951	513	1013	1002	522	1603	252	526	658	913	228	793	1635	2000	164	2000	1786	1941	10	943	411	323	1131	452	2000	1086	1248	248	500
LinkID	1271	1271	1257	1121	1258	1250	1260	1261	1120	1262	495331	1122	495332	2000004	495333	495334	495335	495336	495317	495317	2000003	2000003	7015	18877	7017	7019	7021	7023	1953113	1124	1124	1125	1990014	495307
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	1	2	1	1	1

	Exit 30					Exit 29										Exit 28							Exit 27						Exit 25					
	US 29					MD 193										MD 650							I-95						US 1					
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	25	20	18	17	19	18	22	21	29	30	38	45	43	42	36	30	33	41	52	41	33	30	26	19	16	11	14	15	14	18	29	39	46	48
Density	64	89	99	95	95	87	89	81	73	71	55	47	39	47	54	58	62	51	35	44	43	48	46	78	89	119	95	112	114	90	71	52	44	34
LOS	F	F	F	F	F	F	F	F	F	F	F	F	E	F	F	F	F	F	D	E	E	F	F	F	F	F	F	F	F	F	F	F	E	D
Volume	8038	7021	7063	8049	7303	7809	7826	8370	8375	8402	8426	8395	8372	7901	7837	8610	8196	8211	9007	8958	5692	5697	5940	5877	5764	3856	6529	6520	6557	8177	8157	8184	8087	8159
Lanes	5	4	4	5	4	5	4	5	4	4	4	4	5	4	4	5	4	4	5	5	4	4	5	4	4	3	5	4	4	5	4	4	4	5
Length	260	499	524	1562	808	422	768	284	1222	2000	1072	1153	356	352	505	464	500	1046	1496	1493	1028	536	347	2000	140	1527	1473	2000	1605	671	846	626	481	1017
LinkID	495308	495309	1127	495295	2100087	2000197	2000764	2000770	2000771	1129	1129	1130	7410	2201100	1131	7412	101100	1132	101111	1128	101104	1138	101106	101107	101107	1137	101110	102301	102301	102312	102313	1135	1136	102314
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1

	Exit 24					Exit 23							Exit 22												Exit 20					Exit 19				
	Greenbelt Metro Station					MD 201							MD 295												MD 450					US 50				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	53	53	40	21	16	21	18	40	50	52	52	49	49	51	53	52	53	53	51	52	53	53	53	45	47	52	53	53	53	42	25	27	43
Density	37	36	31	41	79	91	86	87	50	32	32	33	34	40	37	29	37	37	37	38	37	37	29	33	36	43	31	30	25	28	36	55	64	49
LOS	E	E	D	E	F	F	F	F	F	D	D	D	D	E	E	D	E	E	E	E	E	E	D	D	E	E	D	D	C	D	E	F	F	F
Volume	7662	7681	8147	8173	6552	7304	7256	7969	7947	7962	6802	6809	8326	7695	7670	7752	7749	7781	7767	7784	7793	7768	7588	6968	8163	8121	8122	6414	6447	5955	5972	8449	8516	8524
Lanes	4	4	5	5	4	5	4	5	4	5	4	4	5	4	4	5	4	4	4	4	4	4	5	4	5	4	5	4	5	4	4	6	5	4
Length	2000	58	1046	440	1150	761	810	740	938	452	520	566	554	497	516	779	711	2000	2000	2000	1629	1217	263	1180	915	561	1359	1371	213	2000	616	1434	754	2000
LinkID	103501	103501	1139	103502	104704	104706	104707	104709	104710	104711	105902	1140	105904	105906	1141	105908	105909	1142	1142	1142	1142	1143	105910	106105	106108	106109	106110	107301	107302	107307	107307	107309	1144	107311
SegmentID	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	1	1	1	1	1	1	2	1	1	1

2045 Preferred PM

I-495 IL

	Exit 17						**Exit 16**					**Exit 15**							**Exit 13**										**Exit 11**					
	MD 202						Arena Dr					MD 214							Ritchie Marlboro Rd										MD 4					
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	45	46	41	33	27	24	23	22	23	24	44	51	52	48	51	53	52	54	53	53	53	53	53	52	51	52	53	53	51	52	53	52	52	53
Density	47	37	42	63	75	85	79	69	68	63	40	27	31	32	38	37	37	29	29	29	28	35	35	36	36	36	31	31	29	31	31	28	35	34
LOS	F	E	E	F	F	F	F	F	F	F	E	D	D	D	E	E	E	D	D	D	D	D	D	E	E	E	D	D	D	D	D	D	D	D
Volume	8442	8456	8467	6188	6162	6148	7329	7713	7698	7693	7019	7029	6455	7748	7732	7741	7656	7747	6137	6123	7382	7368	7370	7371	7378	7379	6572	6561	7422	6430	6447	7258	7245	7251
Lanes	4	5	5	3	3	3	4	5	5	5	4	5	4	5	4	4	4	5	4	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4
Length	190	855	1495	2000	2000	1908	1069	1470	249	1490	1056	692	986	1397	2000	796	480	997	2000	1072	1492	2000	2000	2000	772	1366	456	484	565	511	527	1147	344	1293
LinkID	107311	107312	1145	108500	108500	108500	109704	109707	1146	1148	110904	110905	110907	110913	1147	1147	1149	110915	111105	111105	111111	111112	111112	111112	111112	1150	112301	1151	112303	112305	1152	112307	112308	1153
SegmentID	2	1	1	1	2	3	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	2	3	4	1	1	1	1	1	1	1	1	1

				Exit 9									**Exit 7**													**Exit 4**								
				MD 337									MD 5													MD 414								
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	53	53	62	63	63	61	59	56	57	62	63	63	62	63	63	63	63	63	63	63	63	62	63	63	63	62	62	62	57	60	58	62	63	63
Density	34	27	28	27	27	25	32	34	33	24	24	19	19	24	20	25	25	25	25	25	25	25	20	23	23	20	22	22	21	25	26	26	17	19
LOS	D	D	D	D	D	C	D	D	D	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B	C
Volume	7222	7223	6767	6786	6754	7533	7502	7548	7515	7527	7535	4747	5920	5939	6193	6239	6247	6244	6242	6236	6228	6201	6190	5922	5872	6277	5535	5517	6049	6062	5955	3199	3211	2391
Lanes	4	5	4	4	4	5	4	4	4	5	5	4	5	4	5	4	4	4	4	4	4	4	5	4	4	5	4	4	5	4	4	2	3	2
Length	896	625	2000	2000	770	663	823	2000	727	761	1487	1134	789	706	691	807	2000	2000	2000	2000	670	860	617	1155	507	909	508	589	349	2000	55	1054	1707	1386
LinkID	1154	112309	113503	113503	113503	114701	114702	1155	1155	114703	1157	115905	115910	115911	115913	115914	1158	1158	1158	1158	1158	1159	115915	116102	1161	116104	116106	1162	116108	116109	116109	116110	116111	117305
SegmentID	1	1	1	2	3	1	1	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	1	2	1	1	1

	Exit 3						**Exit 2**							
	MD 210						I-295							WWB
	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	60	60	59	57	57	57	47	52	52	53	53	53	57	57
Density	13	16	15	20	20	26	29	36	35	34	34	34	30	30
LOS	B	B	B	C	C	D	D	E	D	D	D	D	D	D
Volume	2989	2972	3446	3431	3421	3015	4057	3696	5443	5441	5432	5404	8546	8569
Lanes	4	3	4	3	3	2	3	2	3	3	3	3	5	5
Length	907	581	640	2000	598	1132	851	1030	2000	2000	2000	1329	2000	1262
LinkID	117307	117308	117310	117311	117311	118503	118504	118506	118508	118508	118508	118508	44	44
SegmentID	1	1	1	1	2	1	1	1	1	2	3	4	1	2

2045 Preferred PM - I-270 NB Link Evaluation Results(GP) **4/25/2022**

2045 Preferred PM
I-270 NB

						Exit 1												Exit 4				Exit 5					Exit 6							Exit 8
		I-270 W Spur/I-495				Democracy Blvd		Westlake Terrace				I-270 Spur						Montrose Rd				MD 189					MD 28							Shady Grove Rd
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	7	53	54	55	55	55	55	51	54	52	53	53	53	52	51	53	52	53	53	50	52	53	53	46	41	39	35	24	16	18	16	12	11	11
Density	139	13	10	12	14	10	10	14	17	26	26	28	28	29	29	28	29	27	31	38	36	33	33	35	38	40	51	62	82	87	94	103	110	115
LOS	F	B	A	B	B	A	A	B	B	D	C	D	D	D	D	D	D	D	D	E	E	D	D	E	E	E	F	F	F	F	F	F	F	F
Volume	4749	2094	2100	1930	1513	1643	1651	2785	2796	4073	4086	8934	8936	8947	8950	8912	8938	8472	8154	9404	9391	8757	8743	9601	9427	9375	8997	7548	7788	7786	7405	7248	7152	6267
Lanes	5	3	4	3	2	3	3	4	3	3	3	6	6	6	6	6	6	6	5	5	5	5	5	6	6	6	5	5	6	5	5	6	6	5
Length	2000	1401	366	1048	609	920	256	1210	239	672	1490	1314	966	1203	1125	764	352	601	264	1264	2000	286	764	942	460	533	566	840	662	458	1827	1154	436	347
LinkID	1118	495372	297	949	234	235	237	134	241	242	243	274	275	738	739	280	2541645	428	742	1074	1075	251	743	300	744	304	305	316	745	2541657	320	741	747	2541659
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	

				Exit 9						Exit 10		Exit 11											Exit 13				Exit 15						Exit 16	
				I-370						MD 117		MD 124			Watkins Mill Rd								Middlebrook Rd				MD 118						MD 27	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	13	18	15	15	14	14	14	16	16	19	19	18	18	17	14	19	16	15	15	16	17	16	16	20	20	22	21	27	32	31	23	19	14	16
Density	98	73	80	100	112	108	91	95	93	87	85	87	89	91	100	91	104	109	108	98	79	93	92	84	81	58	70	64	55	47	63	79	83	101
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Volume	6229	7690	6133	4529	6116	6099	7706	7733	7703	6475	6418	6357	6306	6258	7119	7039	8143	8123	8092	7949	7957	7389	7466	6594	6572	6526	6047	5291	5282	5925	4399	4425	4811	4743
Lanes	5	6	5	3	4	4	6	5	5	4	4	4	4	4	5	4	5	5	5	5	6	5	5	4	4	5	4	3	3	4	3	3	4	3
Length	884	477	473	1312	1532	1580	531	843	1357	2000	2000	2000	1479	584	764	579	1112	258	2000	725	763	636	665	872	672	820	1561	1090	527	1713	520	1157	771	687
LinkID	323	336	339	749	411	1209	347	348	754	350	350	350	350	362	363	762	2430241	2430244	10040808	763	364	365	367	369	764	370	372	374	765	376	378	766	380	381
SegmentID	1	1	1	1	1	1	1	1	1	1	2	3	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

											Exit 18																Exit 22							
											MD 121																MD 109							
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	14	19	19	20	20	22	22	21	17	13	12	12	13	13	14	28	44	52	52	52	52	52	52	52	52	52	53	53	53	52	52	52	52	52
Density	88	88	86	82	82	75	76	79	71	106	85	86	107	108	101	51	50	42	41	41	41	41	41	41	41	42	27	38	27	41	40	40	40	40
LOS	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	E	E	E	E	E	E	E	E	D	E	D	E	E	E	E	E
Volume	4964	4956	4924	4944	4941	4938	4980	4968	4981	4008	4263	4306	4323	4297	4323	4327	4314	4327	4312	4285	4329	4306	4308	4320	4331	4319	4325	4061	4206	4216	4208	4204	4201	4196
Lanes	4	3	3	3	3	3	3	3	4	3	4	4	3	3	3	3	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2
Length	457	1044	2000	2000	2000	2000	718	756	736	920	211	877	400	1727	2000	1731	2000	2000	905	482	2000	383	1176	2000	1202	1164	340	1049	451	1025	2000	2000	2000	2000
LinkID	383	384	767	767	767	767	767	768	385	387	389	1001	390	769	391	391	272	272	272	392	394	394	395	396	396	750	397	399	401	402	771	771	771	771
SegmentID	1	1	1	2	3	4	5	1	1	1	1	1	1	1	1	2	1	2	3	1	1	2	1	1	2	1	1	1	1	1	1	2	3	4

							Exit 26																				Exit 31				
							MD 80																				MD 85				
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	52	52	52	52	52	51	51	53	48	48	52	52	53	52	52	52	52	52	52	52	52	52	52	52	52	53	53	52	53	53	53
Density	40	40	40	40	40	41	27	33	29	43	40	40	40	40	40	39	40	39	40	40	40	40	40	40	40	26	37	24	34	25	24
LOS	E	E	E	E	E	E	D	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	D	E	C	D	C	C
Volume	4184	4190	4192	4193	4192	4174	4122	3500	4170	4149	4169	4170	4165	4157	4165	4142	4147	4102	4163	4164	4170	4168	4175	4184	4159	4175	3895	3845	3577	5207	5210
Lanes	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	4	4
Length	1502	2000	1497	2000	698	1279	214	773	615	868	2000	2000	2000	2000	1813	539	1225	391	2000	2000	2000	2000	2000	178	1025	473	1416	241	945	1115	392
LinkID	771	412	412	446	446	783	403	405	407	408	784	784	784	784	784	1010	1017	1007	869	869	869	869	869	869	785	415	417	421	423	425	577
SegmentID	5	1	2	1	2	1	1	1	1	1	1	2	3	4	5	1	1	1	1	2	3	4	5	6	1	1	1	1	1	1	1

2045 Preferred PM - I-270 SB Link Evaluation Results(GP) 4/25/2022

2045 Preferred PM
I-270 SB

					Exit 31																			Exit 26										
					MD 85																			MD 80										
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	57	57	57	58	58	57	58	55	60	62	63	63	63	63	63	63	62	61	60	58	57	57	56	59	59	57	53	56	57	58	56	56	56	56
Density	24	24	24	25	25	17	20	17	24	23	23	23	23	23	23	23	23	24	24	25	25	25	26	16	21	17	27	26	25	25	26	25	26	26
LOS	C	C	C	C	C	B	C	B	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B	C	B	D	D	C	C	C	C	C	C
Volume	4098	4080	4098	2884	2894	2881	2351	2897	2882	2907	2909	2910	2917	2919	2885	2903	2901	2898	2892	2895	2889	2888	2887	2874	2504	2907	2907	2907	2881	2898	2889	2822	2868	2863
Lanes	3	3	3	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2
Length	931	404	446	474	1052	294	849	378	1140	2000	2000	2000	2000	2000	262	2000	2000	2000	2000	2000	2000	548	1088	377	654	1399	88	1849	565	2000	2000	57	2000	2000
LinkID	683	2000012	157	2000014	699	2000016	2000017	2000020	2000021	703	703	703	703	703	703	448	448	448	448	448	448	448	704	201	2000022	2000025	2000026	705	447	455	455	455	453	453
SegmentID	1	1	1	1	1	1	1	1	1	1	2	3	4	5	6	1	2	3	4	5	6	7	1	1	1	1	1	1	1	1	2	3	1	2

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	

					Exit 22																			Exit 18										
					MD 109																			MD 121										
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	56	56	56	56	57	57	58	55	56	57	57	56	56	55	55	55	55	55	54	59	61	61	62	61	63	62	63	63	63	63	63	63	63	63
Density	26	25	25	25	16	24	16	26	26	25	25	26	26	26	27	27	27	27	27	16	16	12	14	12	16	14	18	18	18	18	18	18	13	16
LOS	C	C	C	C	B	C	B	D	C	C	C	C	C	D	D	D	D	D	D	B	B	B	B	B	B	B	C	B	B	B	C	B	B	B
Volume	2852	2834	2811	2789	2772	2684	2854	2863	2872	2862	2862	2907	2933	2924	2943	2942	2925	2929	2920	2915	2913	2906	2545	2983	2979	3411	3413	3413	3414	3416	3415	3391	3391	2950
Lanes	2	2	2	2	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4	3	4	3	4	3	3	3	3	3	3	4	3
Length	2000	1801	1775	948	546	716	1665	130	2000	322	487	2000	475	658	2000	2000	856	2000	1724	624	766	708	839	828	553	1076	2000	2000	2000	2000	214	890	618	1871
LinkID	453	453	410	706	2000027	2000029	2000031	2000032	707	707	2000033	2000034	2000034	2000036	2000037	2000037	2000037	260	260	2000038	708	2000039	2000041	1002	2000044	709	2020578	2020578	2020578	2020578	2020578	710	2000045	2000047
SegmentID	3	4	1	1	1	1	1	1	1	2	1	1	2	1	1	2	3	1	2	1	1	1	1	1	1	1	1	2	3	4	5	1	1	1

	Exit 16					Exit 15				Exit 13										Exit 11			Exit 10						Exit 9				Exit 8	
	MD 27					MD 118				Middlebrook Rd							Watkins Mill Rd			MD 124			MD 117						I-370				Shady Grove Rd	
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	61	62	63	60	63	62	63	62	62	63	63	63	62	62	61	60	64	64	63	60	62	63	63	60	62	63	63	58	63	60	59	59	58	56
Density	15	19	16	16	18	15	19	17	23	23	23	21	21	21	22	18	14	14	19	20	24	23	23	25	20	20	20	21	20	14	17	17	17	19
LOS	B	C	B	B	B	B	C	B	C	C	C	C	C	C	C	B	B	B	C	C	C	C	C	C	C	C	C	C	C	B	B	B	B	C
Volume	3602	3582	3978	3979	3322	3689	3647	4288	4291	4313	4317	5309	5320	5304	5303	5310	3680	3661	4742	5884	5844	5888	5892	7569	7569	7568	7579	7504	5005	5932	5932	5145	5814	6341
Lanes	4	3	4	4	3	4	3	4	3	3	3	4	4	4	4	5	4	4	4	5	4	4	4	5	6	6	6	6	4	7	6	5	6	6
Length	684	1035	1007	1058	1713	543	751	500	1025	2000	723	1566	1324	2000	723	302	1503	595	1133	838	658	2000	1062	1569	1152	411	892	76	1983	705	1678	507	1022	503
LinkID	2000049	2000050	2000052	711	2000054	2000056	2000057	2000059	2000060	712	712	2000062	713	1026	1026	2541400	2000063	718	2000064	2000067	2000068	720	720	2000070	2000097	721	2000071	2000072	2000074	2000078	2000080	2000083	1206	2000089
SegmentID	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1

						Exit 6						Exit 5					Exit 4											Exit 1						
						MD 28						MD 189					Montrose Rd						I-270 Spur				Westlake Terrace	Democracy Blvd						I-270 W Spur/I-495
	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	57	57	57	58	52	58	58	57	56	57	57	57	57	57	50	56	53	56	57	57	56	56	56	56	59	59	58	58	57	57	57	57	57	54
Density	22	22	22	22	8	20	17	17	21	20	20	22	22	20	10	23	23	23	20	20	21	21	20	20	14	14	14	14	18	18	18	14	13	22
LOS	C	C	C	C	A	C	B	B	C	C	C	C	C	C	A	C	C	C	C	C	C	C	C	C	B	B	B	B	C	B	C	B	B	C
Volume	6406	6408	6401	6407	800	5780	6020	6958	7018	7017	7028	6249	6254	6906	510	6543	7431	6537	6920	6903	6889	6872	6854	6872	3278	3281	3282	3121	3123	3092	3120	3103	2891	7108
Lanes	5	5	5	5	2	5	6	7	6	6	6	5	5	6	1	5	6	5	6	6	6	6	6	6	4	4	4	4	3	3	3	4	4	6
Length	1473	603	1534	2000	341	1448	292	500	774	603	720	931	1886	722	2000	847	646	828	795	2000	1722	694	386	570	2000	663	1139	1019	647	491	437	603	695	239
LinkID	2000091	2000094	2000095	2000109	449	2000110	2000118	2000121	2000122	2000125	2000126	160	740	130	445	2000137	2000139	2000141	2000143	129	129	730	443	442	133	133	137	138	224	141	2020142	2115374	194	495375
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1

2045 Preferred PM - I-495 IL Link Evaluation Results (HOT) 4/25/2022

2045 Preferred PM
I-495 IL ETL

			Exit 44			Exit 43			Bridge		Exit 41								Exit 40		Exit 39								
			VA 193			GW Memorial Pkwy			American Legion		Clara Barton Pkwy								Cabin John Pkwy		MD 190						I-270 West Spur		
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	63	63	63	63	63	63	63	63	62	63	63	63	63	63	63	63	63	63	63	63	63	62	62	63	63	64	60	58	58
Density	21	21	21	22	14	21	21	21	17	25	25	25	25	25	25	25	25	25	17	21	21	23	23	22	22	9	9	10	10
LOS	**C**	**C**	**C**	**C**	**B**	**C**	**C**	**C**	**B**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**B**	**C**	**C**	**C**	**C**	**C**	**C**	**A**	**A**	**A**	**A**
Volume	2720	2717	2716	2721	2725	2600	2596	2596	3118	3132	3131	3133	3118	3134	3128	3129	3131	3137	3125	2706	3936	4198	4227	4220	4203	568	569	571	570
Lanes	2	2	2	2	3	2	2	2	3	2	2	2	2	2	2	2	2	2	3	2	3	3	3	3	3	1	1	1	1
Length	2000	1496	2000	928	812	2000	564	1301	1240	2000	780	21	218	2000	291	266	2000	591	1047	934	1051	225	2000	1622	498	17	2000	772	43
LinkID	20802	20800	495419	2541257	10562	2551731	2551731	2540002	2550303	1238	1238	2541406	2541405	2540006	2540006	12536	2541689	2541689	1307	127	2551750	2553339	2541418	2541418	152	2540029	2540025	2540033	10530
SegmentID	1	1	1	1	1	1	2	1	1	1	2	1	1	1	2	1	1	2	1	1	1	1	1	2	1	1	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	

2045 Preferred PM - I-495 OL Link Evaluation Results (HOT) **4/25/2022**

2045 Preferred PM

I-495 OL ETL

										Exit 39			**Exit 40**							**Exit 41**		**Bridge**			**Exit 43**			**Exit 44**		
				I-270 West Spur						**MD 190**			**Cabin John Pkwy**							**Clara Barton Pkwy**		**American Legion**			**GW Memorial Pkwy**			**VA 193**		
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	53	60	56	56	64	64	64	64	63	64	64	64	63	63	63	63	63	63	63	63	63	63	63	63	64	64	63	63	64	64
Density	8	7	7	7	6	14	14	14	10	12	14	14	17	17	17	17	17	17	17	17	17	17	17	11	9	9	14	14	14	14
LOS	**A**	**A**	**A**	**A**	**A**	**B**	**B**	**B**	**A**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**A**	**A**	**B**	**B**	**B**	**B**
Volume	411	410	410	410	411	2615	2627	2633	2619	2205	1835	1829	2180	2183	2182	2170	2178	2175	2176	2179	2179	2173	2172	2165	1163	1159	1738	1734	1742	1738
Lanes	1	1	1	1	1	3	3	3	4	3	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2
Length	24	832	8	1619	809	708	2000	287	583	1241	22	905	1098	1730	2000	288	510	13	2000	1677	22	1042	603	694	2000	900	954	787	2000	873
LinkID	10535	958	2540036	2540024	1305	2540022	10040793	12696	11338	11337	2551752	2551748	1295	1296	2540010	2540010	2540005	2541409	2541408	2541408	11746	11884	11893	11867	11850	11850	10566	20847	20849	20797
SegmentID	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	1	1	1	2	1	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	

2045 Preferred PM - I-270 NB Link Evaluation Results (HOT) 4/25/2022

2045 Preferred PM
I-270 NB ETL

	I-270 West Spur/I-495				Exit 1 Democracy Blvd		Westlake Terrace			I-270 Spur							Exit 4 Montrose Rd			
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	63	63	63	62	61	61	63	61	62	63	62	62	63	62	63	63	63	63	62	63
Density	29	29	29	20	28	28	19	17	25	25	19	29	29	29	29	29	29	29	20	24
LOS	D	D	D	C	D	D	C	B	C	C	C	D	D	D	D	D	D	D	C	C
Volume	3650	3660	3657	3652	3419	3413	3602	3147	3139	3144	3612	3631	3634	3636	3635	3644	3645	3644	3640	3059
Lanes	2	2	2	3	2	2	3	3	2	2	3	2	2	2	2	2	2	2	3	2
Length	2000	2000	1096	652	24	340	2000	697	2000	145	1152	2000	1551	1518	484	18	1064	1145	366	2000
LinkID	2540027	2540027	2541353	149	10705	436	479	2541573	2541575	2541575	2541357	2541356	2541356	2541373	2541375	2541377	2541365	2541385	2541391	150
SegmentID	1	2	1	1	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1

			Exit 5 MD 189							Exit 6 MD 28					Exit 8 Shady Grove Rd				Exit 9 I-370	
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	63	63	62	63	63	63	63	63	63	63	63	62	63	31	16	20	21	14	14	14
Density	24	18	27	27	27	27	27	27	27	27	27	28	22	44	91	71	67	112	114	113
LOS	C	C	D	D	D	D	D	D	D	D	D	D	C	E	F	F	F	F	F	F
Volume	3057	3420	3415	3411	3419	3418	3419	3418	3419	3422	3426	3426	2748	2728	2911	2874	2863	1572	1569	1572
Lanes	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1
Length	1242	506	2000	1945	19	1864	4	291	6	828	2000	1038	2000	1340	2000	758	193	2000	1178	562
LinkID	150	793	143	143	2541382	2541333	2541340	2541339	2541338	2541337	2541330	2541330	2541324	2541324	2541319	2541316	1207	2541633	2541633	2541623
SegmentID	2	1	1	2	1	1	1	1	1	1	1	2	1	2	1	1	1	1	2	1

Speed Color Scale (mph)

🟥	🟧	🟨	🟩	🟩
10	30	40	50	70

2045 Preferred PM - I-270 SB Link Evaluation Results (HOT) 4/25/2022

2045 Preferred PM
I-270 SB ETL

	Exit 9				**Exit 8**									**Exit 6**				**Exit 5**		
	I-370				**Shady Grove Rd**									**MD 28**				**MD 189**		
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	51	57	61	61	63	63	63	63	64	64	62	62	63	63	63	63	63	63	63	63
Density	17	15	15	14	15	15	15	10	12	12	12	19	19	19	19	18	18	18	12	16
LOS	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**A**	**B**	**B**	**B**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**B**	**B**
Volume	888	887	889	887	1865	1867	1866	1845	1532	1535	2319	2334	2337	2336	2342	2334	2328	2317	2309	1974
Lanes	1	1	1	1	2	2	2	3	2	2	3	2	2	2	2	2	2	2	3	2
Length	284	331	2000	52	1091	2000	505	314	2000	1713	451	2000	928	849	449	1667	2000	1774	410	2000
LinkID	2541297	2541300	2541314	2541314	790	2541318	2541318	40	789	789	2541326	2541602	2541602	2541331	2541335	2541341	2541343	2541343	142	144
SegmentID	1	1	1	2	1	1	2	1	1	2	1	1	2	1	1	1	1	2	1	1

				Exit 4											**Exit 1**				
				Montrose Rd						**I-270 Spur**			**Westlake Terrace**		**Democracy Blvd**			**I-270 West Spur/I-495**	
Direction of Travel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Speed	63	62	61	62	63	63	63	63	63	63	60	63	56	57	63	63	64	63	63
Density	16	15	22	22	22	22	22	22	14	17	12	15	16	11	8	12	12	18	17
LOS	**B**	**B**	**C**	**C**	**C**	**C**	**C**	**C**	**B**	**B**	**B**	**B**	**B**	**A**	**A**	**B**	**B**	**B**	**B**
Volume	1981	2732	2734	2733	2731	2722	2712	2714	2721	2198	2205	1816	1825	1815	1469	1482	1490	2216	2208
Lanes	2	3	2	2	2	2	2	2	3	2	3	2	2	3	3	2	2	2	2
Length	1372	876	746	1132	420	1519	2000	2000	1049	1604	705	1888	25	275	721	1116	589	1600	802
LinkID	144	2541393	2541386	2541366	2541369	2541370	2541355	2541355	2541358	2541354	2541583	2541581	10707	456	145	151	2540026	223	1304
SegmentID	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1

🟥	🟧	🟨	🟩	🟩	**Speed Color Scale (mph)**
10	**30**	**40**	**50**	**70**	