4 TRANSPORTATION AND TRAFFIC

The preliminary traffic forecasts and analysis results for the Preferred Alternative were documented in the Supplemental DEIS **(SDEIS), Chapter 3** and **SDEIS, Appendix A**. Results have been updated and finalized in this Final Environmental Impact Statement (FEIS).

SDEIS, Chapter 3: https://oplanesmd.com/wp-content/uploads/2021/09/SDEIS_03_Traffic.pdf

SDEIS, Appendix A: https://oplanesmd.com/wp-content/uploads/2021/09/SDEIS_AppA_Traffic-Evaluation-Memo_web.pdf

What is the same in this FEIS Chapter from the SDEIS:

- The Preferred Alternative is the same: Alternative 9 - Phase 1 South.
- The design year is the same: 2045.
- The same version of the Metropolitan Washington Council of Governments (MWCOG) model was used: Version 2.3.75.
- The same VISSIM model limits were used.
- Baseline conditions for the year 2017 are unchanged.

What is updated in this FEIS Chapter:

- Traffic forecasts and analysis results for the 2045 No Build Alternative have been updated based on new information related to background projects (including the VDOT 495 NEXT project and the Greenbelt Metro Interchange) and forecast refinements to address comments received on the SDEIS (**Section 4.2**)
- Traffic forecasts and analysis results for the Preferred Alternative have been updated to reflect design changes described in **FEIS, Chapter 3** that were made following coordination with various stakeholders to further improve operations and/or minimize property and environmental impacts (**Section 4.3**).
- The discussion regarding the impact of COVID-19 on traffic demand and forecasts and the State's ongoing monitoring plan has been updated per the latest data (**Section 4.5**).

What is new in this FEIS Chapter:

- A detailed evaluation of the operations along cross streets and adjacent intersections, summarized in **Section 4.4.1** and documented in **FEIS, Appendix B**.
- A detailed safety evaluation, including predictive crash modeling, summarized in **Section 4.4.2** and documented in **FEIS, Appendix B**.
- The results of a COVID-19 sensitivity analysis, summarized in **Section 4.5** and documented in **FEIS, Appendix C**.

4.1 Introduction

As noted in **Chapter 1**, one of the needs for the I-495 & I-270 Managed Lanes Study (Study) is to accommodate existing traffic and long-term traffic growth on I-270 and I-495. An understanding of current and projected traffic demands on the transportation network along the study corridors and the surrounding area is essential to properly evaluate how each of the Build Alternatives would address these traffic challenges. The DEIS and its appendices presented results from the traffic operational analyses conducted for the 2040 No Build Alternative and eight (8) Build Alternatives (Alternative 5, Alternative 8, Alternative 9, Alternative 9M, Alternative 10, Alternative 13B, Alternative 13C, and the MD 200 Diversion Alternative). The SDEIS and its appendices presented the draft results from the traffic operational analyses conducted for the 2045 No Build condition and the Preferred Alternative: Alternative 9 - Phase 1 South. This chapter presents updated and finalized results for the 2045 No Build Alternative and Preferred Alternative, summarizes the results of a detailed safety evaluation, and presents the findings from a sensitivity analysis evaluating potential long-term travel impacts related to the ongoing COVID-19 pandemic. For additional details on each of these topics, refer to the *Final Traffic Analysis Technical Report* in **FEIS, Appendix A**, the *MDOT SHA's Draft Application for Interstate Access Point Approval (IAPA) Report* in **FEIS, Appendix B**, and the *Final COVID-19 Travel Analysis and Monitoring Plan* in **FEIS, Appendix C**.

4.1.1 Traffic Analysis Data Collection and Modeling Methodology

Baseline conditions were established at the beginning of the Study reflecting year 2017 conditions. The baseline traffic data and existing calibrated models are unchanged from the DEIS. The DEIS assumed a design year of 2040. In the SDEIS and this FEIS, an updated design year of 2045 was used. Refer to paragraph 1 below and **Section 4.1.3** for additional details regarding why the design year was updated, as planned. Detailed traffic operational analyses were performed to evaluate the Preferred Alternative's ability to meet the Study's Purpose and Need based on year 2045 conditions. Similar to the DEIS and SDEIS, the evaluation methodology for the FEIS included a three-step process:

1. First, a regional forecasting model was developed for the No Build Alternative and Preferred Alternative using the MWCOG model, which is the model regularly used by MDOT SHA and other transportation agencies to evaluate projects in the Washington, DC metro area. For the SDEIS, MDOT SHA used an updated version of the MWCOG model, Version 2.3.75, which was released in Fall 2018. The DEIS used an earlier version of the MWCOG model, Version 2.3.71. There are three primary differences between the model versions. First, land use data was updated as part of 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, these 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. The FEIS used the same MWCOG model version as the SDEIS (Version 2.3.75).

2. Next, the outputs from the MWCOG model were imported into a VISSIM model to develop traffic volume projections for the design year of 2045 for each roadway segment and ramp movement within the study limits during the peak periods for the No Build Alternative and Preferred Alternative. These peak hour forecasts were updated for the FEIS based on new information related to background projects and to account for design changes to the Preferred Alternative that were made following coordination with various stakeholders to further improve operations and/or minimize property and environmental impacts following the SDEIS. Forecasts were also refined in response to comments received from the public and agencies on the SDEIS.

3. Finally, traffic simulation models were developed for the 2045 No Build Alternative and 2045 Preferred Alternative using VISSIM software to determine the projected operational performance in several key metrics during the AM peak period (6AM to 10AM) and the PM peak period (3PM to 7PM). The metrics were selected to evaluate the effectiveness of each of the Build Alternatives to efficiently move people through the region and to provide benefits to the transportation system. The metrics used in this FEIS were the same used to evaluate the other Build Alternatives in the DEIS and the SDEIS: speed, delay, travel time, level of service (LOS), throughput, and local network impacts.

4.1.2 Traffic Analysis Area

The traffic analysis area for the FEIS extended beyond the study limits to capture upstream and downstream effects. Evaluation of the Preferred Alternative in the FEIS used the same limits for the VISSIM simulation models as in the DEIS and the SDEIS, as shown in **Figure 4-1** and listed below:

- I-495 from VA 193 in Virginia across the American Legion Bridge (ALB) and through the state of Maryland to the Woodrow Wilson Bridge
- I-270 from the I-70 ramp merges to I-495, including the East and West Spurs

Additionally, the updated version of the MWCOG model used to develop 2045 volume projections for the SDEIS and this FEIS covered the same area as the previous version for the DEIS: the entire National Capital Region of surrounding roadways in 22 jurisdictions, including Montgomery County, Prince George's County, and Frederick County in Maryland, as well as Arlington County and Fairfax County in Virginia, and the District of Columbia.

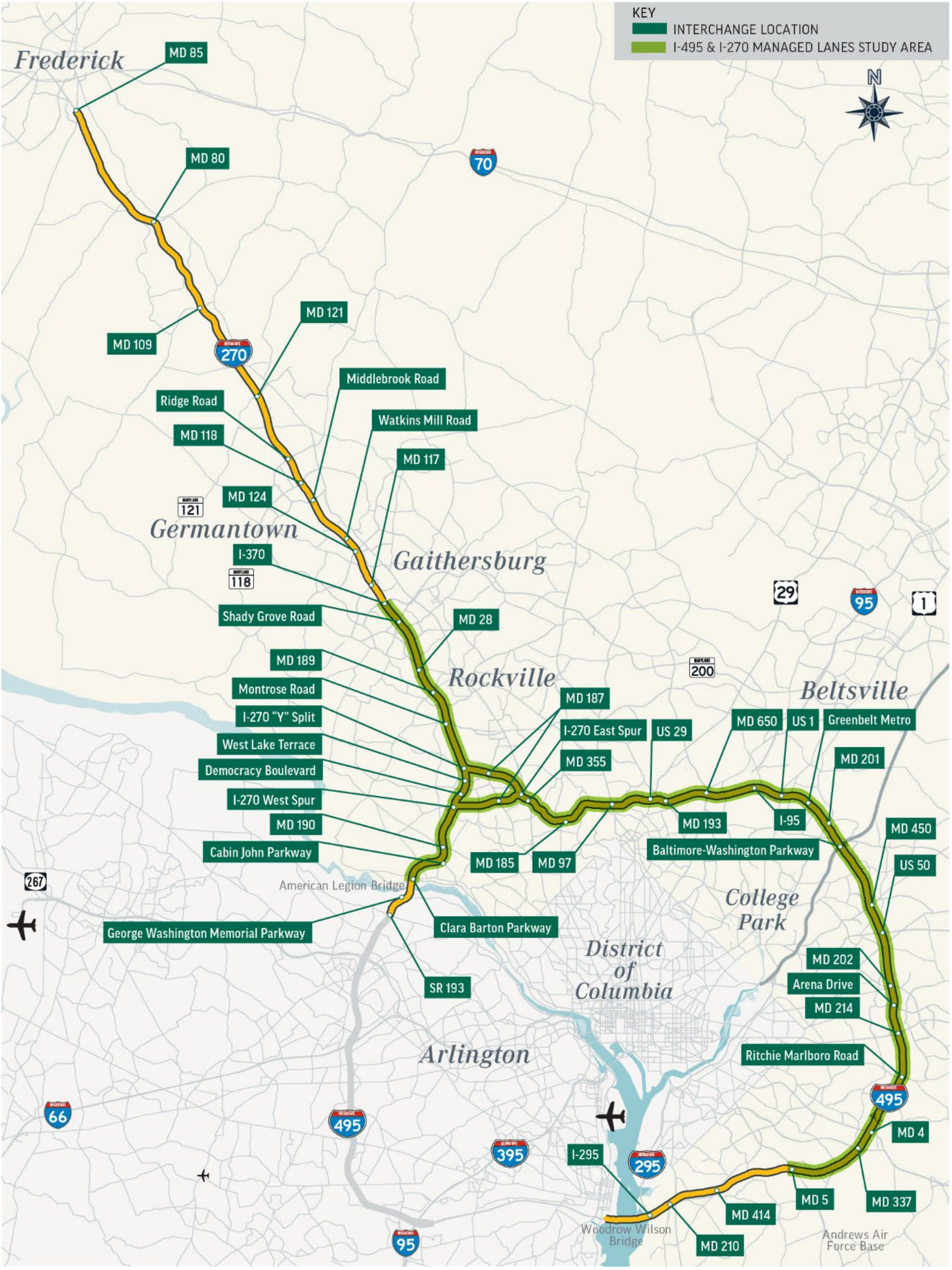
4.1.3 Traffic Modeling Assumptions

The following summarizes the assumptions applied to the traffic modeling results presented in this FEIS, including discussion of the design year, background projects, managed lane design elements, tolling, and new technologies, such as connected and autonomous vehicles (CAV).

A. Design Year

The DEIS used a 2040 design year to evaluate the No Build and Build Alternatives. MDOT SHA assumed the design year 2040 for all traffic analysis in the DEIS because at the time the Study began, that was the latest approved regional forecasting model from MWCOG. The 2040 forecasts were used to compare alternatives and determine which alternatives would be expected to provide the best operational benefit to meet the Study's Purpose and Need. A new version of the MWCOG model was approved and released in October 2018 that projected traffic demand out to the year 2045. The DEIS included a sensitivity analysis comparing the 2040 forecasts to the 2045 forecasts (refer to *Appendix J* of the *Traffic Analysis Technical Report* in **DEIS, Appendix C**,) 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 this FEIS.

Figure 4-1: Limits of VISSIM Model Network and Interchange Locations Included along I-495 and I-270



B. Background Roadway Projects

The analysis for the 2045 design year assumed completion of several background projects included in the region's CLRP. The impacts of these background projects were assumed as part of the baseline conditions for the design year 2045 No Build Alternative and the 2045 Preferred Alternative. The following roadway projects of regional significance within the study limits were not in the baseline (year 2017) model but were assumed to be in place in the year 2040 in the DEIS and are also assumed to be in place in the year 2045 for the purposes of this FEIS, as described on the following page.

- I-270 Innovative Congestion Management (ICM) Improvements
- Virginia Department of Transportation (VDOT) I-495 Express Lanes Northern Extension (495 NEXT)
- I-270 at Watkins Mill Road Interchange (open to traffic in June 2020)
- Greenbelt Metro Station Access Improvements
- MD 97 Montgomery Hills Project
- MD 185 Salt Barn (completed in 2020)

The I-270 ICM Project involves a series of spot improvements and traffic management strategies to improve operations and safety along the I-270 corridor. The goal of the ICM Project is to address existing and short-term needs along the I-270 corridor. Construction of the ICM improvements is ongoing and is expected to be completed in 2022. The I-495 & I-270 Managed Lanes Study has been designed to be compatible with the improvements implemented under the I-270 ICM Project. Elements of the ICM improvements will be maintained following construction of the Preferred Alternative, including ramp metering, auxiliary lane improvements in multiple locations along both directions of I-270 south of I-370, and all improvements north of I-370. Elements that will not be maintained involve changes to the auxiliary lanes associated with the existing C-D Road, which will be removed as part of the Preferred Alternative.

The 495 NEXT project involves an extension of the existing I-495 Express Lanes system in Virginia to the ALB. MDOT SHA has been coordinating with VDOT throughout the project to ensure consistency and compatibility of both projects. The forecasts and designs of the 495 NEXT project have been updated in this FEIS to reflect the latest proposed design based on this coordination.

Construction of the Watkins Mill Interchange has been completed and the project was opened to traffic in June 2020. The 2045 No Build and 2045 Preferred Alternative models both include this project.

The Greenbelt Metro Station Access Improvements project is an MDOT SHA proposed project to convert the existing partial interchange between I-495 and the Greenbelt Metro Station into a full movement interchange. This project is currently in the planning stage. Forecasts for this project have been updated in this FEIS to reflect the latest planning efforts.

The MD 97 Montgomery Hills project is an MDOT SHA proposed project to improve pedestrian and bicycle connectivity and mobility along MD 97 in the vicinity of the I-495 interchange, while balancing traffic operations. This project is currently in the design stage. The latest forecasts and designs of this project are reflected in this FEIS.

Construction of a Salt Barn along the ramp from the I-495 Outer Loop to MD 185 was completed in 2020. The 2045 No Build and 2045 Preferred Alternative models both include this project. For additional details regarding these background projects, refer to *Final Traffic Analysis Technical Report* in **FEIS, Appendix A**.

C. Background Transit Projects

Additionally, the benefits of the following proposed transit projects on the traffic demands for the roadway network within the study corridors were accounted for in both the 2040 and 2045 modeling:

- Purple Line Light Rail
- Corridor Cities Transitway
- US 29 Bus Rapid Transit (BRT)
- Randolph Road BRT
- North Bethesda Transitway

The updated 2045 MWCOG model also includes the following additional transit projects that are part of Montgomery County's Rapid Transit System that were not included in the 2040 model:

- MD 355 BRT
- Veirs Mill Road BRT
- New Hampshire Avenue BRT

Potential roadway or transit improvements on I-270 from north of I-370 to I-70 were not included as part of this Study, as alternatives for that phase of I-270 will be developed as part of a separate National Environmental Policy Act (NEPA) process (https://oplanesmd.com/i270-environmental/).

D. Managed Lanes Design

Each of the Build Alternatives evaluated as part of the traffic analysis for the DEIS, and the Preferred Alternative evaluated in the SDEIS and this FEIS, included managed lanes. The managed lanes were assumed to be buffer-separated with a physical delineation using flexible delineators from the adjacent general purpose lanes. Access would be provided via grade separated direct connections at interchanges or via at-grade exchange ramps at key locations, as described below.

E. Direct Access Locations

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. For more information on direct access locations, see **Chapter 3, Section 3.1.3**, and **Figure 3-3**.

- 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:
  - 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)
  - Wootton Parkway (new interchange)
  - Gude Drive (new interchange)
  - I-370 (to/from the south)

F. Tolling

The Preferred Alternative will include tolling of the HOT managed lanes. The final toll policies and toll rate ranges for the proposed managed lanes have been approved and were defined following Maryland's regulatory requirements as described in **Chapter 3, Section 3.1.9**. The managed lanes would operate under a dynamic tolling approach where the toll rates would change in response to real-time variations in traffic conditions. For the purposes of the analysis in this FEIS, the volume in the managed lanes would be set to maintain a minimum average operating speed of at least 45 miles per hour (mph)[1] and not exceed 1,600 to 1,700 vehicles per hour per lane in the highest demand section of the managed lanes. The remaining portion of demand for each freeway section would be in the general purpose lanes. For *planning purposes only*, the dynamically priced toll rates from the initial MWCOG model runs for use in evaluating the Build Alternatives in the DEIS were retained for use in this FEIS, as shown in the *Final Traffic Analysis Technical Report* in **FEIS, Appendix A**. The dynamic toll rates used by MWCOG for travel demand modeling were developed as "per mile" rates based on an iterative process for each alternative and ranged from $0.20 to $1.36 per mile (in 2016 dollars). The iterative process was designed to estimate appropriate toll values to control the volume of traffic using the managed lanes through a combination of volume to capacity ratios and maintaining a minimum operating speed at or near free-flow conditions. The toll rates produced as part of this MWCOG modeling process were developed by MWCOG staff. MDOT SHA did not perform this step for traffic forecasting and traffic analysis purposes, because the estimated toll values for future-year networks were provided by MWCOG when the model was transmitted to MDOT SHA. In November 2021, MDTA approved toll rate ranges for use on the I-495 and I-270 HOT lanes in Maryland (https://mdta.maryland.gov/ALB270TollSetting/TollRateRangeSettingProcessAndApprovedTollRateRanges). While it was too late in the process to incorporate those values directly into the modeling and analysis for the FEIS, the assumed MWCOG values are similar and were sufficient for use in planning level activities. Projected volumes in the HOT lanes were refined for this FEIS through post processing efforts, as described in **FEIS, Appendix A**, but the base tolling assumptions from the MWCOG model did not change.

G. Connected and Automated Vehicles

The expected influx of CAVs will impact future traffic operations on all roads in Maryland, including I-495 and I-270, as well as nationwide. 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

[1] If average speeds in managed lanes drop below 45 mph during weekday peak periods 90% of the time over a 180-day period, federal law requires that the public authority with jurisdiction over the facility develop a plan of action toward bringing the facility into compliance (23 USC. 166 (d)(2)(B)).

demand and capacity to include CAVs directly in the traffic forecasts. Capacity will likely increase as vehicle spacing decreases, but the magnitude of the capacity increase is difficult to quantify based on the current research. Also, the benefits of more vehicles per lane may be offset by a potential increase in demand on the transportation network for some types of auto trips, including "mobility as a service" trips (people that could call an autonomous vehicle for a solo trip, rather than owning their own car) and "deadhead" trips (trips where the autonomous vehicle is empty, traveling to a parking lot or to the next pickup point). Therefore, the traffic projections for this Study apply traditional forecasting techniques, while being cognizant of the potential future CAV impacts.

4.2 Forecasting

Forecasts for the Study were developed using the methodologies and assumptions described in Section 4.1 and the *Final Traffic Analysis Technical Report* in **FEIS, Appendix A**. The results are summarized below.

4.2.1 Baseline Conditions

Baseline conditions were developed for the year 2017 and reflect conditions prior to the onset of the COVID-19 pandemic, which began affecting traffic demand and volumes in early 2020. COVID-19 considerations are described later in this chapter in **Section 4.5**. The study limits include many of the most heavily traveled, most congested, and most unreliable roadway segments in Maryland.[2] According to the *2020 Maryland State Highway Mobility Report*, the top four highest volume roadway sections in Maryland based on average daily traffic (ADT) are contained within the study limits. These locations include I-270 from the I-270 Split to MD 117; I-495 from the Virginia State Line to the I-270 West Spur; I-495 from MD 4 to I-95; and I-495 from the I-270 East Spur to I-95. **Table 4-1** shows the baseline existing (year 2017) ADT for each segment within the study area, which reflects total traffic in both directions.

Table 4-1: Existing Average Daily Traffic (ADT)

Corridor	Segment	Existing Volumes (2017)
I-270 (both directions)	I-370 to MD 28	226,000
	MD 28 to I-270 Spur	259,000
I-495 (both directions)	at American Legion Bridge	243,000
	MD 190 to I-270 Spur	253,000
	Between I-270 Spurs	119,000
	MD 355 to I-95	235,000
	I-95 to US 50	230,000
	US 50 to MD 214	235,000
	MD 214 to MD 4	221,000
	MD 4 to MD 5	198,000

[2] Segments as defined by *2020 Maryland State Highway Mobility Report*

4.2.2 2045 Volumes

Traffic volumes throughout the study corridors are projected to continue to grow over the next 20 to 25 years due to expected increases in population and employment in the Washington, DC metropolitan region. Refer to **Chapter 1, Section 1.3.1**, and **Tables 1-1** and **1-2** for additional details. **Table 4-2** below shows the projected design year 2045 ADT for each segment along I-495 and I-270 within the study limits for the No Build and Preferred Alternative. Despite many segments already operating at or near capacity, daily traffic volumes on I-270 and I-495 are projected to continue to increase between now and the design year 2045 under the No Build condition. Locations that add capacity to I-270 and I-495 under the Preferred Alternative would be projected to see an increase in daily traffic volumes served compared to the No Build Alternative because the freeways would be able to accommodate latent demand that would otherwise use the local roadway network to avoid congestion.

While these forecasts were developed using models that do not specifically include potential long-term impacts of the COVID-19 pandemic on travel behavior, a sensitivity analysis was conducted evaluating several "what if" scenarios, including potential sustained changes in teleworking, eCommerce, and transit use on projected 2045 travel demand and operations, as described in **Section 4.5**.

Table 4-2: 2045 Average Daily Traffic (ADT)

Corridor	Segment	No Build (2045)	Preferred Alternative (2045)
I-270	I-370 to MD 28	270,000	284,000
	MD 28 to I-270 Spur	299,000	320,000
I-495	at American Legion Bridge	280,000	306,000
	MD 190 to I-270 Spur	283,000	318,000
	Between I-270 Spurs	126,000	136,000
	MD 355 to I-95	250,000	253,000
	I-95 to US 50	248,000	250,000
	US 50 to MD 214	256,000	258,000
	MD 214 to MD 4	249,000	251,000
	MD 4 to MD 5	223,000	224,000

4.3 Traffic Analysis for No Build and Preferred Alternatives

Using the forecast volumes described in **Section 4.2**, the Preferred Alternative was evaluated and compared to the No Build condition in the design year of 2045 for several key operational metrics, including delay, travel time, speed, LOS, throughput, and the effect on the local network. These metrics are the same metrics used in the DEIS and SDEIS to evaluate and compare the alternatives, but results have been updated for this FEIS to reflect the latest forecasts and design based on stakeholder input to further improve operations and/or minimize property and environmental impacts, as described in **Chapter 3**. The results were obtained from the MWCOG model and the VISSIM traffic simulation models and are summarized in the following sections. For additional details, refer to the **FEIS, Appendix A,** *Final Traffic Analysis Technical Report***.**

4.3.1 Delay

System-wide delay was calculated to determine the average amount of time each vehicle in the traffic simulation model would be delayed while trying to reach its destination. Delay can be caused by slow travel due to congestion or vehicles yielding the right-of-way at stop-controlled or signalized intersections. **Table 4-3** shows the projected average delay per vehicle in the entire network under the No Build Alternative and the Preferred Alternative during the 2045 AM peak period and the 2045 PM peak period. 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).

Table 4-3: 2045 System-Wide Delay for Entire Study Area

Alternative	Average Delay (min/vehicle)		Percent Improvement vs. No Build	
	AM Peak (6-10AM)	PM Peak (3-7PM)	AM Peak (6-10AM)	PM Peak (3-7PM)
No Build	12.2	11.3	N/A	N/A
Preferred Alternative	10.6	7.0	13%	38%

The results indicated that the Preferred Alternative would be projected to reduce system-wide delay by 13 percent during the AM peak period and by 38 percent during the PM peak period compared to 2045 No Build conditions. These results reflect all vehicles in the model, including those traveling on I-495 and I-270 for the entire length of the study area (including the no action areas) and those traveling through and within the cross-street interchanges.

4.3.2 Travel Time

Travel time index (TTI) was calculated for each segment of I-495 and I-270 based on the outputs from the traffic simulation model. TTI quantifies the average travel time and congestion levels during the peak periods and is defined as the ratio of the average (50th percentile) travel time during a particular hour to the travel time during free-flow or uncongested conditions. TTI also serves as a proxy for the Planning Time Index (PTI), which is used to estimate reliability, because there is a strong correlation between PTI and TTI. Roadways with a lower TTI have some reserve capacity to absorb the disruption caused by non-recurring congestion (and generally have a lower PTI), while roadways with high TTI values are more likely to be impacted by minor incidents (and generally have a higher PTI). **Table 4-4** shows the weighted average TTI values for the entire study area (including the no action areas) in the general purpose 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.

Table 4-4: 2045 Travel Time Index (TTI) for Entire Study Area

Alternative	Weighted Average TTI[1] (General Purpose Lanes)
No Build	2.0
Preferred Alternative	1.8

Note: [1] Reflects weighted average TTI on I-270 and I-495 during peak hours (7-8AM and 4-5PM)

MDOT SHA defines "congestion" as any roadway segment with a TTI value greater than 1.15, while "severe congestion" is reached at TTI values of 2.0. Under the 2045 No Build Alternative, the weighted average TTI along I-270 and I-495 during the peak hours is 2.0, which reflects severe congestion throughout the study area. The results indicated that the general purpose lanes under the Preferred Alternative would improve compared to No Build from a TTI of 2.0 to a TTI of 1.8 in the design year of 2045. This reflects an improvement from the severe congestion category to the "heavy congestion" category (defined as TTI between 1.3 and 2.0). TTI values broken down by segment are provided in **Table 4-5** and have been color coded based on MDOT SHA's definition of uncongested conditions, moderate congestion, heavy congestion, and severe congestion.

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 ALB. All HOT lanes would be projected to operate at uncongested levels (TTI < 1.15). Additional details are provided in the *Final Traffic Analysis Technical Report* in **FEIS, Appendix A.**

Table 4-5: 2045 Travel Time Index (TTI) Results for General Purpose Lanes from VISSIM Model

Peak Period	Corridor	Alternative	
		No Build	Preferred
AM Peak Hour (7-8AM)	I-270 Northbound from I-495 to I-370	1.1	1.0
	I-270 Southbound from I-370 to I-495	1.3	1.2
	I-495 Inner Loop from Virginia 193 to I-270	1.4	1.0
	I-495 Outer Loop from I-270 to Virginia 193	1.5	1.1
	I-495 Inner Loop from I-270 to I-95[3]	1.0	1.1
	I-495 Outer Loop from I-95 to I-270[3]	2.9	2.7
	I-495 Inner Loop from I-95 to MD 5[3]	2.7	2.6
	I-495 Outer Loop from MD 5 to I-95[3]	2.5	2.5
PM Peak Hour (4-5PM)	I-270 Northbound from I-495 to I-370	2.2	1.7
	I-270 Southbound from I-370 to I-495	1.0	1.0
	I-495 Inner Loop from Virginia 193 to I-270	3.8	4.0
	I-495 Outer Loop from I-270 to Virginia 193	2.4	1.0
	I-495 Inner Loop from I-270 to I-95[3]	2.8	2.4
	I-495 Outer Loop from I-95 to I-270[3]	1.8	1.1
	I-495 Inner Loop from I-95 to MD 5[3]	1.4	1.5
	I-495 Outer Loop from MD 5 to I-95[3]	2.7	1.9

Notes: [1] 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; Severe Congestion (red) – TTI ≥ 2. [2] This table summarizes TTI in the general purpose lanes. All HOT/Express Toll Lanes would have TTI values in the uncongested range (TTI less than 1.15). [3] Gray shaded rows reflect segments outside Phase 1 South limits.

4.3.3 Speed

The metric of average speed was calculated from the traffic simulation model output. Speed data was compiled for all links in the system. **Table 4-6** shows the average speed for the Preferred Alternative in the general purpose lanes and the HOT lanes for the entire study limits of I-495 and I-270 during 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 the No Build Alternative in the design year of 2045. The results are shown for the entire study limits to be consistent with the results presented in the DEIS and SDEIS, even though the Build improvements for the Preferred Alternative are only in the Phase 1 South limits.

Table 4-6: 2045 Average Speed – Entire Study Area

Alternative	Average Speed[1] (General Purpose Lanes)	Average Speed[1] (HOT Lanes)
No Build	24 mph	N/A
Preferred Alternative	28 mph	60 mph

Note: [1] Reflects weighted average speed on I-270 and I-495 during peak hours (7-8AM and 4-5PM)

The results 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 general purpose lanes by four mph on average throughout the study area during the peak periods compared to the No Build condition.

Detailed corridor travel speed results by peak hour and direction for the general purpose lanes and the managed lanes are provided in **Table 4-7**. During the 2045 AM peak, speeds in the I-495 general purpose 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 general purpose 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 general purpose 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 general purpose 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 general purpose lanes throughout the study area. Average speeds in the general purpose 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.

Table 4-7: 2045 Corridor Travel Speed (mph) Results from VISSIM Model

Peak Period	Corridor	Travel Lanes	Alternative	
			No Build	Preferred
AM Peak Hour[3] (7-8AM)	I-270 Northbound from I-495 to I-370	General Purpose Lanes	55[2]	61
		HOT Lanes	-	63
	I-270 Southbound from I-370 to I-495	General Purpose Lanes	44[2]	45
		HOT Lanes	-	62
	I-495 Outer Loop from I-270 West Spur to George Washington Memorial Parkway	General Purpose Lanes	35	50
		HOT Lanes	-	62
	I-495 Inner Loop from George Washington Memorial Parkway to I-270 West Spur	General Purpose Lanes	38	55
		HOT Lanes	-	63
	I-495 Outer Loop from MD 5 to I-270 West Spur[1]	General Purpose Lanes	20	22
		HOT Lanes	-	-
	I-495 Inner Loop from I-270 West Spur to MD 5[1]	General Purpose Lanes	26	26
		HOT Lanes	-	-
PM Peak Hour[3] (4-5PM)	I-270 Northbound from I-495 to I-370	General Purpose Lanes	27[2]	27
		HOT Lanes	-	45
	I-270 Southbound from I-370 to I-495	General Purpose Lanes	57[2]	58
		HOT Lanes	-	63
	I-495 Outer Loop from I-270 West Spur to George Washington Memorial Parkway	General Purpose Lanes	22	52
		HOT Lanes	-	63
	I-495 Inner Loop from George Washington Memorial Parkway to I-270 West Spur	General Purpose Lanes	14	15
		HOT Lanes	-	62
	I-495 Outer Loop from MD 5 to I-270 West Spur[1]	General Purpose Lanes	19	32
		HOT Lanes	-	-
	I-495 Inner Loop from I-270 West Spur to MD 5[1]	General Purpose Lanes	25	24
		HOT Lanes	-	-

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. [3] Results reported here for the overall AM and PM peak hours, consistent with DEIS and SDEIS. For complete results covering entire study period (6-10AM, 3-7PM), refer to **FEIS, Appendix B.**

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 general purpose 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 general purpose 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 general purpose 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 general purpose lanes north of I-370. As noted earlier in **Section 4.1.3**, 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.

4.3.4 Level of Service

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 passenger cars per mile per lane. The percentage of lane-miles projected to operate at LOS F during the peak periods in the design year of 2045 was calculated from the traffic simulation model output for the Preferred Alternative and the No Build Alternative. The results include the entire study areas (including the no action areas) and are shown in **Table 4-8.** Detailed tables showing LOS by segment are provided in the **FEIS, Appendix A,** *Final Traffic Analysis Technical Report***.**

Table 4-8: 2045 Percent of Lane-Miles Operating at LOS F for Entire Study Area

Alternative	Percent of Lane-Miles Operating at LOS F		
	AM Peak Hour (7-8AM)	PM Peak Hour (4-5PM)	Average
No Build	32%	47%	40%
Preferred Alternative	26%	30%	28%

The results indicated that the Preferred Alternative would be effective at reducing the number of failing segments within the study corridors 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). In the design year of 2045, the percentage of lane-miles projected to operate at LOS F would decrease by more than 10 percent because of the Preferred Alternative. However, it is projected that 28 percent of the lane miles would continue to operate at LOS F in the design year of 2045 under the Preferred Alternative, primarily in areas that would have no action (namely, I-495 east of the I-270 east spur).

4.3.5 Throughput

The metric of vehicle throughput was calculated from the traffic simulation model output to quantify how efficiently goods, services, and people could be moved through the study corridors under each alternative. Throughput represents the number of vehicles that pass by a given point in the roadway network in a set amount of time. Four key locations were chosen for evaluating throughput during the peak periods: I-495 crossing the ALB, I-495 west of I-95, I-495 at MD 5, and I-270 at Montrose Road. 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 considered representative of the entire study area. **Table 4-9** summarizes the average vehicle-throughput at the four key locations for the No Build Alternative and the Preferred Alternative in terms of vehicles per hour. The values include traffic traveling in both directions and account for vehicles traveling in both the general purpose lanes and the managed lanes. For consistency, the same four key locations used in the DEIS and SDEIS are reported in this FEIS even though the Preferred Alternative includes no action in two of the four locations. Under No Build conditions, the number of vehicles (and people) that can travel through the system during the peak period is constrained by congestion. The Preferred Alternative would result in approximately 13 percent increased throughput compared to the No Build Alternative at the key locations, from an average of 15,700 vehicles per hour to an average of 17,700 vehicles per hour. This translates into increased efficiency of the roadway network in getting people, goods, and services to their destinations. Additional 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.

Table 4-9: 2045 Vehicle Throughput at Key Locations

Alternative	Average Vehicle Throughput at Four Key Locations[1] (vehicle/hour)
No Build	15,700
Preferred Alternative	17,700

Note: [1] Evaluation locations include I-495 at ALB, I-495 west of I-95, I-495 at MD 5, I-270 at Montrose Road

Table 4-10 provides additional detail by showing the vehicle throughput results generated from the VISSIM outputs at each key location during the AM peak hour (7:00 AM to 8:00 AM) and the PM peak hour (4:00 PM to 5:00 PM). Results are reported in terms of vehicles per hour and percent increase in vehicle-throughput for the Preferred Alternative compared to the No Build Alternative, rounded to the nearest five percent. As expected, the most significant increases under the Preferred Alternative occur at the locations where HOT lanes are proposed (I-495 at the ALB and I-270 at Montrose Road).

4.3.6 Local Network

While the focus of the Study is to provide benefits to travelers using I-495 and I-270, the proposed action would also have impacts on the surrounding local roadway network.[3] This impact was quantified by using the results of the MWCOG regional model output for the No Build Alternative and the Preferred Alternative to calculate the total vehicle hours of delay on all arterials in Montgomery County, Maryland,

[3] For the purposes of this Study, the local roadway network includes minor and principal arterials, but not roadways that are classified as expressways, freeways, or interstate.

Prince George's County, Maryland, and the District of Columbia. Other regions in Maryland and Virginia showed negligible changes in local delay because of the project.

Table 4-10: 2045 Vehicle Throughput Results from VISSIM Model

Metric	Peak Period	Location	Alternative	
			No Build	Preferred
Vehicle-Throughput (vehicle/hour)	AM Peak Hour (7-8AM)	I-270 at Montrose Rd	18,182	19,855
		I-495 at American Legion Bridge	18,204	22,346
		I-495 west of I-95	14,381	14,525
		I-495 at MD 5	8,847	8,990
	PM Peak Hour (4-5PM)	I-270 at Montrose Rd	19,246	22,182
		I-495 at American Legion Bridge	17,002	22,472
		I-495 west of I-95	15,881	16,639
		I-495 at MD 5	13,804	14,325
Percent Change in Vehicle-Throughput vs. 2045 No Build	AM Peak Hour (7-8AM)	I-270 at Montrose Rd	N/A	10%
		I-495 at American Legion Bridge	N/A	25%
		I-495 west of I-95	N/A	0%
		I-495 at MD 5	N/A	0%
	PM Peak Hour (4-5PM)	I-270 at Montrose Rd	N/A	15%
		I-495 at American Legion Bridge	N/A	30%
		I-495 west of I-95	N/A	5%
		I-495 at MD 5	N/A	5%

Note: Gray shaded rows indicate locations outside Phase 1 South limits.

Table 4-11 shows the total vehicle hours of delay and percent reduction compared to the 2045 No Build Alternative for arterials in Montgomery County, Prince George's County, and the District of Columbia individually. The results indicated that the Preferred Alternative would be projected to result in a net reduction in daily delay on the surrounding arterials of 3.5 percent by drawing traffic off the local network, despite some localized increases in arterial traffic near the managed lane access interchanges. Montgomery County would be projected to experience the largest local network savings under the Preferred Alternative as a result of the proposed physical roadway widening along portions of I-495 and I-270 in Montgomery County to provide HOT lanes under this Alternative. Prince George's County and the strict of Columbia would also expect to experience some benefits to the local network despite no physical roadway improvements within these jurisdictions under the Preferred Alternative.

Table 4-11: 2045 Local Network Results from MWCOG Model

Metric	Alternative	
	No Build	Preferred
Daily Delay (vehicle-hours) for All Arterials in Montgomery County	242,408	230,882
Percent Reduction vs. No Build (Montgomery County)	N/A	4.8%
Daily Delay (vehicle-hours) for All Arterials in Prince George's County	160,143	157,832
Percent Reduction vs. No Build (Prince George's County)	N/A	1.4%
Daily Delay (vehicle-hours) for All Arterials in District of Columbia (DC)	176,612	169,859
Percent Reduction vs. No Build (District of Columbia)	N/A	3.8%
Total Daily Delay (vehicle-hours) for All Arterials in Montgomery County, Prince George's County, and the District of Columbia (DC)	579,163	558,573
Percent Reduction vs. No Build (Total)	N/A	3.5%

4.3.7 Summary

The following summarizes the results of the design year 2045 traffic operational evaluation for the No Build Alternative and the Preferred Alternative presented in this chapter of the FEIS.

1. The **No Build Alternative** would not address any of the significant operational issues experienced under existing conditions, and it would not be able to accommodate long-term traffic growth, resulting in slow travel speeds, significant delays, long travel times, and an unreliable network. Compared to the 2040 No Build results presented in the DEIS, the 2045 No Build results show generally higher delays and travel times on I-495 and I-270 due to additional projected traffic growth between 2040 and 2045. This traffic growth is anticipated despite additional transit projects included in the 2045 forecast that will help to slightly reduce projected delays on the surrounding local roadway network.

2. The **Preferred Alternative** is projected to provide meaningful operational benefits to the system even though it includes no action or no improvements for a large portion of the study area to avoid and minimize environmental and property impacts. This alternative would significantly increase throughput across the ALB and on the southern section of I-270 while reducing congestion. It would also increase speeds, improve reliability, and reduce travel times and delays along the majority of I-495, I-270, and the surrounding roadway network compared to the No Build Alternative. Although the Preferred Alternative provides less improvement to traffic operations when compared to the Build Alternatives that included the full 48-mile study limits evaluated in the DEIS (such as Alternatives 9 and 10), it was chosen based in part on feedback from the public and stakeholders who indicated a strong preference for eliminating property and environmental impacts on the top and east side of I-495. Congestion would still be present during the PM peak period on I-270 northbound and the I-495 inner loop in the design year of 2045 due to downstream bottlenecks outside of the Preferred Alternative limits but would not get worse due to implementing the Preferred Alternative.

4.4 MDOT SHA's Draft Application for Interstate Access Point Approval

Per the FHWA *Policy on Access to the Interstate System* (updated May 22, 2017), any project that would result in new or revised access points to interstate facilities requires development of an IAPA report to document that an operational and safety analysis has concluded that the proposed change in access would not have a significant adverse impact on the safety and operation of the interstate facility (including mainline lanes, existing and proposed ramps, and ramp intersections with the cross streets) or on the local street network based on both current and future traffic projections. Proposed access must also connect to public roads only and must provide for all traffic movements, except for special applications such as managed lanes that are considered on a case-by-case basis. Section 111(a) of Title 23, United States Code, provides that State departments of transportation (State DOTs) may not add any points of access to, or exit from, the interstate system without prior approval of the Secretary. The Secretary has delegated this authority to the Federal Highway Administrator pursuant to Title 23, Code of Federal Regulations, Paragraph 1.48(b)(10).

The Preferred Alternative includes many new and revised access points and therefore IAPA documentation will be required for this project before it is constructed. As part of this process, MDOT SHA has prepared a Draft Application for IAPA, which is included with in **FEIS, Appendix B**. The results of the operational and safety evaluations contained in that document are summarized below. While MDOT SHA and FHWA have coordinated throughout the project on elements to be included in MDOT SHA's Draft Application for IAPA, formal approval of the IAPA documentation cannot occur until after the Record of Decision (ROD). The information contained in MDOT SHA's Draft Application for IAPA and summarized below is considered draft until an affirmative determination by FHWA of safety, operational, and engineering acceptability is obtained.

4.4.1 Operations of Interchanges, Cross Streets and Termini

The operations of interchanges, cross streets, and project termini were evaluated as part of MDOT SHA's Draft Application for IAPA. Analysis was conducted using VISSIM simulation modeling software to evaluate interstate mainline segments, ramp merge, diverge, and weave segments, ramp junctions and ramp intersections. The analysis in MDOT SHA's Draft Application for IAPA includes all interchanges within the Phase 1 South limits affected by the Preferred Alternative, as well as one adjacent interchange on either side. A total of 19 interchanges were evaluated. Operational metrics included density and speed by lane, LOS, throughput, and queuing.

The evaluation ensured that the number of lanes provided and the auxiliary lane lengths for merge, diverge, and weave operations were sufficient to achieve acceptable operations in the design year 2045 at all interchanges impacted under the Preferred Alternative and at the project termini locations where the HOT lanes tie back into the general purpose lanes on I-270 and I-495 and where the proposed HOT lanes in Maryland tie into the proposed HOT lanes system in Virginia. The latest design for the Preferred Alternative presented in this FEIS reflects the modifications required to provide acceptable operations on the freeways and freeway junctions.

For analysis of the adjacent arterials, cross streets, and intersections, Synchro/SimTraffic simulation models were developed using Version 10.3. A total of 60 intersections were evaluated for the No Build Alternative and 67 intersections were evaluated under the Preferred Alternative, as the project will result in a net increase of seven signalized intersections. Operational metrics determined for each intersection included delay, LOS, and queues for all intersections, approaches, and movements.

Most of the intersections studied were projected to operate acceptably under the Preferred Alternative when comparing 2045 No Build and 2045 Build conditions. However, two locations were identified where intersection improvements are proposed to improve safety and/or operations. These intersections are located near new managed lane access ramps and are projected to attract additional traffic that would degrade operations compared to the No Build Alternative if additional improvements were not provided. Therefore, additional turn lanes and signal timing adjustments were included at the following intersections:

- Wootton Parkway at Seven Locks Road
- Gude Drive at Research Boulevard

Preliminary designs at these two locations were coordinated with affected stakeholders. The proposed improvements have been incorporated into the overall Preferred Alternative design presented in this FEIS, and the limit of disturbance has been adjusted, as needed, to account for this operational mitigation when determining environmental and property impacts. Coordination with stakeholders will continue during final design (post ROD). For complete details, refer to **FEIS, Appendix B**.

4.4.2 Safety Evaluation

The safety evaluation conducted as part of MDOT SHA's Draft Application for IAPA included a thorough review of existing crash data and crash patterns for all freeways, ramps, intersections, and crossroads; an evaluation of crash rates and the identification of high crash locations within the study area; a qualitative assessment of how key design elements from the Preferred Alternative would be expected to influence safety and affect high crash locations within the study area; and a quantitative analysis that focuses on the relative comparison results from predictive crash analysis under the No Build Alternative and the Preferred Alternative.

Over the three-year crash study period between 2016 and 2018, approximately 4,700 crashes occurred within the study area. Seventy-three percent of the crashes along the freeways were rear end and sideswipe collisions that occurred during congested roadway conditions. The Preferred Alternative reduces congestion levels during peak periods to address the needs of the system and accommodate existing traffic and long-term traffic growth on I-270 and I-495. By reducing the extent and duration that the freeways and local roadways operate under congestion, unstable flow, and stop-and-go conditions, it can be anticipated that the Preferred Alternative will reduce the potential for congestion-related crashes, such as rear-end and sideswipe crashes occurring during peak periods.

The Preferred Alternative will replace aging structures, provide new pavement, and include improved geometrics, which are also likely to result in safety improvements. While the project will include tighter cross sections through specific sections of roadway to avoid impacts to critical resources, introduce new signalized intersections along some crossroads, and include additional merge and diverge access points along the freeway at certain locations, safety improvement and mitigation considerations have been identified and will continue to be evaluated through the future design efforts. Overall, it can be concluded that the Preferred Alternative should not have a significant adverse impact on the safety of the study corridors. For complete details of the safety evaluation, refer to **FEIS, Appendix B**.

4.5 COVID-19 Considerations and Plan Results

The COVID-19 global pandemic impacted 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. To adapt to the ongoing and potential long-term travel impacts associated with the pandemic, MDOT SHA developed a *COVID-19 Travel Analysis and Monitoring Plan* for the Study. The latest version of the plan is included in **FEIS, Appendix C**. The plan includes three components, with additional details on each in the following sections:

- **Monitoring**: tracking changes in roadway and transit demand during the pandemic, including daily and hourly volume data, i.e., how does travel change in response to the number of cases, vaccine distribution, unemployment rates, school closings, and policy changes;
- **Research:** reviewing historical data and surveys/projections from the Transportation Research Board and the National Capital Region Transportation Planning Board; and
- **Sensitivity Analyses**: evaluating "what if" scenarios, including potential changes in teleworking, eCommerce, and transit use on projected 2045 travel demand and operations.

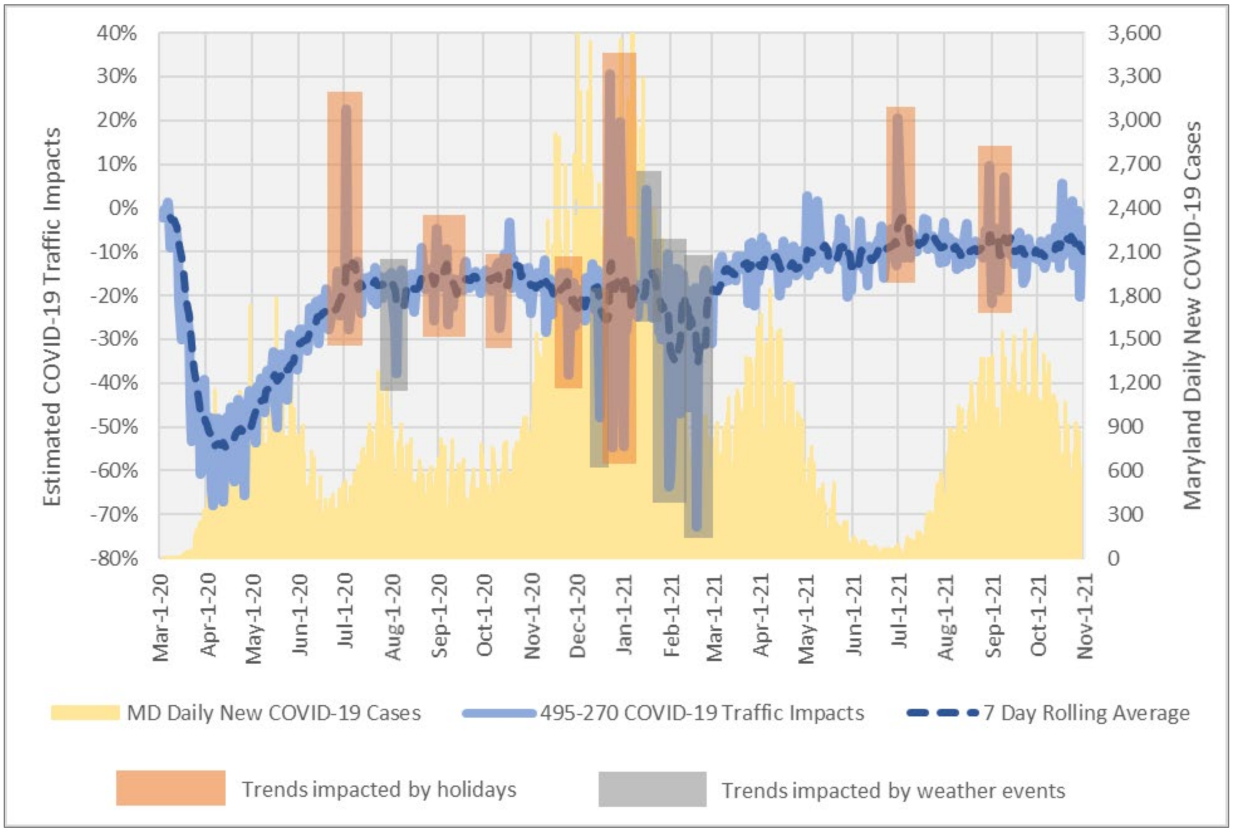
4.5.1 Monitoring

As part of its ongoing mission, and in response to public comments on the DEIS, MDOT SHA has been closely monitoring the changes in traffic patterns throughout the pandemic. **Figure 4-2** shows how traffic volumes within the study corridors have fluctuated during the pandemic compared to pre-pandemic levels. The data shows a severe drop in traffic volumes in April 2020 after stay-at-home orders were issued across Maryland, with daily traffic volumes on I-270 and I-495 reducing by more than 50 percent compared to April 2019. After the stay-at-home order was replaced with a "safer at home" advisory in May 2020, traffic volumes gradually increased throughout the summer, stabilizing at approximately 15 percent less than typical conditions during fall 2020. As cases began to surge in November/December 2020, traffic volumes dipped again through the winter. With the rollout of vaccines in early 2021, the corresponding drop in COVID-19 cases, and the gradual reopening of schools and businesses, daily traffic volumes have continued to recover. Volumes were back to over 90 percent of normal as of November 2021 compared to expected 2021 levels, even when considering two years of projected growth since 2019. MDOT SHA will continue to monitor volumes into winter/spring 2021-2022.

Statewide, weekly traffic volumes were within one percent of November 2019 values in November 2021, per MDOT's coronavirus tracking website, linked below. Volumes during the afternoon peak hour have recovered closer to pre-pandemic levels compared to morning hours and daily volumes, with some permanent count stations on I-270 and I-495 recording higher volumes between 5PM and 6PM in October 2021 than October 2019. Transit use has been slower to recover, with usage of Washington Metropolitan Area Transit Authority (WMATA) facilities down significantly in November 2021 compared to November 2019. WMATA rail ridership was down 73 percent on weekdays, while WMATA bus ridership was down 36 percent on weekdays, and parking at Metro facilities was down 88 percent in November 2021 (https://www.wmata.com/initiatives/ridership-portal/upload/November-2021-Ridership-Snapshot.pdf).

Similarly, Maryland Transit Administration (MTA) services statewide were down over 40 percent compared to pre-pandemic levels as of November 2021 per data presented on MDOT's coronavirus tracking website: (https://www.mdot.maryland.gov/tso/Pages/Index.aspx?PageId=141).

Figure 4-2: Daily Traffic Volume Changes on I-495 and I-270 During COVID-19 Pandemic vs. 2019



The combined effect of changes in traffic volumes and changes in transit usage on speeds and congestion along I-495 and I-270 has also been monitored by MDOT SHA through a partnership with the Regional Integrated Transportation Information System (RITIS). RITIS compiles transportation-related data from a variety of sources, including speed and congestion data from INRIX, which MDOT SHA can obtain for any day and facility through the RITIS web portal. A review of this data indicated that congestion decreased significantly on I-495 and I-270 at the onset of the pandemic in Spring 2020, corresponding to the sharp decline in traffic volumes during that time. However, by November 2021, significant congestion had returned to the study area, approaching pre-pandemic levels. For example, average speeds on the I-495 Inner Loop crossing the ALB during the PM peak in early November (non-holiday) of 2021 were 20 mph, reflecting significant congestion, and matching the speeds during the similar period in November 2019 (also 20 mph). In the AM peak, average speeds on the I-495 Outer Loop between MD 650 and US 29 in early November 2021 were even lower - below 15 mph. While these speeds are slightly higher than those observed in that same area during the AM peak in November 2019 (10 mph), the findings indicate that there is still substantial congestion along I-495 even though volumes have not fully rebounded to pre-pandemic levels along I-495 during the morning peak period. Along I-270, average speeds are generally 5 to 10 mph higher in November 2021 compared to November 2019 despite volumes exceeding 2019 levels at MDOT SHA's permanent count station located on I-270 South of MD 121. These increased speeds could be attributed to recent improvements completed by MDOT SHA along I-270, including the opening of the Watkins Mill interchange in 2020 and the implementation of ramp metering along southbound I-270 on-ramps in September 2021 as part of the ICM project. Even so, some congestion remains along I-270, with average speeds on I-270 southbound of approximately 30 mph during the AM peak period in November 2021 and average speeds on I-270 northbound below 40 mph during the PM peak period in November 2021.

MDOT SHA has also monitored an additional metric of congestion and reliability, TTI. As noted in **Section 4.3.2**, TTI is defined as the ratio of the average (50th percentile) travel time during a particular hour to the travel time during free-flow or uncongested conditions. MDOT SHA defines "congestion" as any roadway segment with a TTI value greater than 1.15, while "severe congestion" is reached when TTI values reach 2.0. **Table 4-12** below shows the number of hours each day in which congestion was present on I-495 and I-270 in October 2021 based on observed TTI values compared to the baseline pre-pandemic condition (year 2017).

Table 4-12: TTI Monitoring Summary

Roadway	Baseline 2017		October 2021	
	# Of Hours Ave TTI > 1.15	# Of Hours Max TTI > 2.0	# Of Hours Ave TTI > 1.15	# Of Hours Max TTI > 2.0
I-495	10	10	9	11
I-270	8	8	5	8

In October 2021, the average TTI along I-495 (in both directions) exceeded 1.15 for 9 hours of the day (6:00 AM to 10:00 AM and 2:00 PM to 7:00 PM), while severe congestion (TTI > 2.0) was experienced in at least one segment of I-495 for 11 hours of the day (6:00 AM to 11:00 AM and 1:00 PM to 7:00 PM). These results are similar to the baseline (year 2017) data, in which the average TTI along I-495 exceeded 1.15 and severe congestion was experienced in at least one segment of I-495 for 10 hours of the day (6:00 AM to 10:00 AM and 2:00 PM to 8:00 PM). On I-270, the average TTI (in both directions) exceeded 1.15 for 5 hours of the day in October 2021 (6:00 AM to 9:00 AM and 4:00 PM to 6:00 PM), while severe congestion (TTI > 2.0) was experienced in at least one segment of I-495 for 8 hours of the day (6:00 AM to 10:00 AM and 3:00 PM to 7:00 PM). These results are slightly better than the baseline (year 2017) data, in which the average TTI along I-270 exceeded 1.15 and severe congestion was experienced in at least one segment of I-495 for 8 hours of the day (6:00 AM to 10:00 AM and 3:00 PM to 7:00 PM).

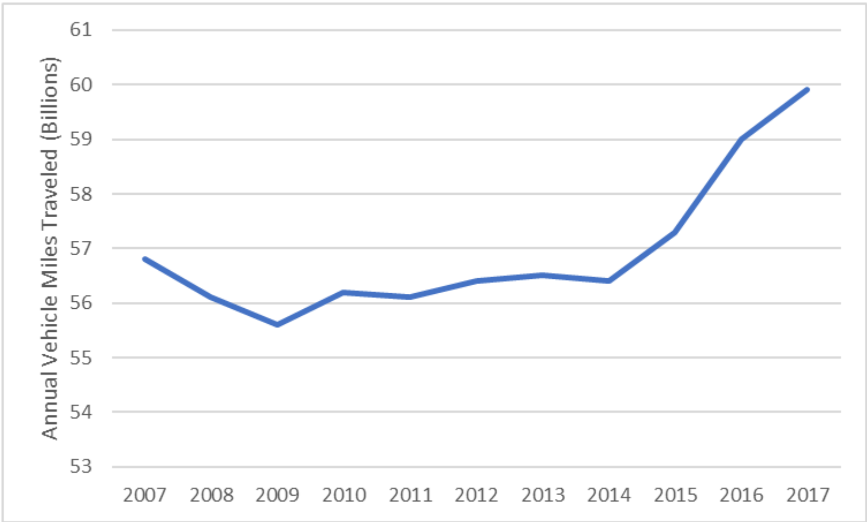
4.5.2 Research

MDOT SHA conducted research related to the COVID-19 pandemic, which involved reviewing historical data and surveys/projections from the Transportation Research Board, the National Capital Region Transportation Planning Board, and other transportation agencies.

A review of past economic events and societal changes effects on travel was conducted. The most recent relevant event was the recession that occurred in 2007 and 2008. This recession had a prolonged effect on travel in Maryland, with impacts lasting for several years. The recession was compounded with a dramatic increase in fuel costs that further suppressed travel. However, a review of MDOT SHA Mobility

Reports indicated that annual vehicle miles traveled (VMT) in Maryland returned to 2007 levels by 2015 and continued to increase significantly after that through 2017, as shown in **Figure 4-3**. Despite the dip in traffic volumes during and immediately following the recession, overall traffic growth in the 10 year period between 2007 and 2017 was more than 5 percent. In fact, traffic growth continued through 2019, and Maryland set a record for VMT in 2019 with 60.1 billion VMT. This pattern is similar to other historical events that have caused a temporary dip in travel (such as the 1979 energy crisis), while the long-term trend line has continuously showed steady growth in VMT nationwide since 1970.

Figure 4-3: VMT Growth Trends in Maryland (2007 – 2017)



Source: Maryland State Highway Mobility Reports

Throughout the Study, MDOT SHA has stayed abreast of available information, research studies, and guidance within the larger transportation industry, including the following reports and presentations, which are included in **FEIS, Appendix C** for reference:

- Presentation: How Much Will COVID-19 Affect Travel Behavior? by the National Academies of Sciences Engineering and Medicine Transportation Research Board, 6/1/2020
- Presentation: COVID-19 Impacts on Managed Lanes by the National Academies of Sciences Engineering and Medicine Transportation Research Board, 6/25/2020
- Memorandum: Transportation Impacts of the COVID-19 Pandemic in the National Capital Region by the National Capital Region Transportation Planning Board Technical Committee, 9/3/2020
- Presentation: Commuter Connections 2020 Employer Telework Survey – Coronavirus Pandemic Survey Results by the National Capital Region Transportation Planning Board Technical Committee, 9/16/2020
- Report: Capital COVID-19 Snapshot: Safe Return to Work by the Greater Washington Partnership, summarizing results from a survey conducted in August 2020.
- Presentation: Visualizing Effects of COVID-19 on Transportation: A One-Year Retrospective by the National Academies of Sciences Engineering and Medicine Transportation Research Board, 3/8/2021

- Poster: Observed and Expected Impacts of COVID-19 on Travel Behavior in the United States. A Panel Study Analysis presented at the 2022 National Academies of Sciences Engineering and Medicine Transportation Research Board Annual Meeting, 1/11/2022

4.5.3 Sensitivity Analysis

As noted above, MDOT SHA has developed a *COVID-19 Travel Analysis and Monitoring Plan* to monitor and analyze the impacts of the COVID-19 pandemic on existing and future travel. MDOT SHA must ensure that transportation improvements are being developed to meet our State's needs not only for today, but for the next 25-plus years. Historically, vehicular travel has increased as the economy recovered following economic events and societal changes, such as the 2008 Great Recession. Traffic volumes within the study area have continued to increase as businesses and schools reopened throughout the year 2021.

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 and results presented in **Section 4.3** using models that were developed and calibrated prior to the onset of the COVID-19 pandemic have been determined to be reasonable for use in evaluating projected 2045 conditions. However, MDOT SHA acknowledges that residual effects of some of the near-term changes in travel behavior could be carried forward into the future. Therefore, a sensitivity analysis evaluating several "what if" scenarios related to future traffic demand due to potential long-term changes to teleworking, e-commerce, and transit use was also conducted as part of the *COVID-19 Travel Analysis and Monitoring Plan.* The results of the sensitivity analysis are summarized below.

The first part of the sensitivity analysis involved modifying input parameters in the MWCOG regional forecasting model based on observed changes in travel behavior during the pandemic to evaluate a range of potential long-term scenarios. Potential long-term travel impacts associated with the pandemic that could be captured within the travel demand model included changes in household travel due to increased work from home, remote learning possibilities, and increased discretionary travel, a reduction in non-home-based trips, and a decrease in long distance travel via airports, and changes in long-distance automobile travel. For additional details, refer to the *COVID-19 Scenario Analysis* report included as an Attachment within **FEIS, Appendix C**.

Three potential scenarios were modeled using the MWCOG model. The "high impact" scenario replicated observed travel conditions in late 2020/early 2021 before the rollout of vaccines when the economy was functioning with continued work from home and restrictions on long distance travel impacting visitor travel were still in place. During this period, there was approximately a 15% reduction in VMT in the region compared to typical conditions, but this scenario would be unlikely in the long term. Two other more-likely scenarios were designed to capture potential levels between the high scenario and the original forecasts. These included a "low impact" scenario that assumed a part-time work from home schedule (one to two days per week) for select industries along with limited remote learning opportunities (five percent) and a "medium impact" scenario that assumed parameters between the low and high values. For each scenario, several model outputs were generated, including total trips, VMT, total delay, and LOS. While each scenario resulted in fewer trips, less VMT, and less overall delay than the original forecasts, a large portion of the project corridors would be projected to experience poor levels of service (LOS E or F) under No Build conditions in all scenarios. This evaluation confirmed that the project would still be needed, even if long-term effects of the pandemic were in the high impact range resulting in less traffic demand than originally projected.

The second part of the sensitivity analysis involved re-running the 2045 No Build and 2045 Build VISSIM models that were used to generate the operational results presented in **Section 4.3**, but with reduced demand volumes to account for potential sustained impacts from the pandemic. For this analysis, traffic count data collected by MDOT SHA in the second week of November 2021 (when COVID-19 case counts were relatively low, vaccines and boosters were widely available, most schools were open for in-person learning, but many employers continued to offer flexible telework – a reasonable potential long-term scenario). Data was collected at five permanent count stations located along I-270 and I-495 was compared to count data at the same locations during the same time period on the same week in November 2019. The results indicated that volumes during the AM peak period (6:00 AM to 10:00 AM) were approximately five percent less than normal, while volumes during the PM peak period (3:00 PM to 7:00 PM) were approximately three percent less than normal. Therefore, the VISSIM sensitivity analysis was conducted with AM peak period volumes five percent less and PM peak period volumes three percent less than projected in the original design year 2045 forecasts, and operational metrics were evaluated to determine the relative benefit of the Preferred Alternative under that hypothetical scenario.

The results indicate that the Preferred Alternative would also provide meaningful operational benefits to the system under a reduced-demand scenario. As shown in **Table 4-13** below, the Preferred Alternative would be projected to reduce system-wide delay by nine percent during the AM peak period and by 48 percent during the PM peak period compared to 2045 No Build conditions. In the AM peak period, the relative benefits of the Preferred Alternative are slightly less than for the original forecasts (nine percent versus 13 percent savings) because morning travel is impacted more significantly by factors related to the pandemic, such as increased telework. However, during the PM peak period, the relative benefits of the Preferred Alternative are higher under a reduced-demand scenario than in the original forecasts (48 percent versus 38 percent savings). This is because any long-term reduction in traffic volumes would help improve operations in the no action areas that would otherwise constrain the overall benefits of the Preferred Alternative, particularly during the PM peak period. Additional results from this VISSIM sensitivity analysis for other operational metrics are provided in **FEIS, Appendix C**.

Table 4-13: 2045 Sensitivity Analysis - System-Wide Delay for Entire Study Area

Alternative	Average Delay (min/vehicle)		Percent Improvement vs. No Build	
	AM Peak (6-10AM)	PM Peak (3-7PM)	AM Peak (6-10AM)	PM Peak (3-7PM)
No Build	8.0	8.4	N/A	N/A
Preferred Alternative	7.3	4.4	9%	48%

Note: Sensitivity analysis assumes 5% less volume during AM peak and 3% less volume during PM peak

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.