Review of Maryland I-495 & I-270 Managed Lanes Final Environmental Impact Statement and Final Section 4(f) Evaluation

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Exhibit B

I. Qualifications

I received a B.S. in Mathematics from Worcester Polytechnic Institute (1977) and an M.S. in Engineering Sciences from Dartmouth College (1982). My studies at Dartmouth College included graduate courses in transportation modeling.

I have 34 years of professional experience in transportation modeling and transportation planning including 14 years at RSG Inc. (1987-2001) and 20 years at Smart Mobility Inc. (2001-now).

My primary professional focus is regional travel demand modeling and related transportation planning. I am a nationally known expert in this field and have completed projects in over 30 states including work for the U.S. government, state Departments of Transportation, Metropolitan Planning Organizations, cities and non-profit organizations. One of my particularly notable projects is a $250,000 project with the California Air Resources Board where I led a team including the University of California in reviewing the state's regional travel demand models.

I have many peer-reviewed publications and conference presentations, including presentations at national Transportation Research Board conferences in 2017, 2018 and 2019.

I am an Associate Member of the Transportation Research Board.

My resume is attached as Appendix D.

In this report I provide my expert review of the I-495 and I-270 Managed Lanes Study Final Environmental Impact Statement (FEIS) traffic model on behalf of the Sierra Club Maryland Chapter. I also provided the expert review of the traffic model, which were incorporated into the prior comments submitted by the Sierra Club Maryland Chapter.

In my opinion, the agencies have failed to comply with their own Agency guidance concerning traffic modeling, and the output is seriously compromised as a result of these modeling errors.

Significantly, the Agencies admitted that our SDEIS traffic model comments questioning certain throughput figures "have merit" and that there were "anomalies in that data that the agency re-evaluated."[1] They continue in their response: "Updated throughput tables are presented in the FEIS and have addressed the concerns identified."[2] These acknowledgements are indicative of our qualifications for accurate review of traffic

[1] FEIS App'x T.2.B. Vol 2, June 17, 2022, page CO-828, https://oplanesmd.com/wp-content/uploads/2022/06/68_MLS_FEIS_App-T-DEIS-SDEIS-CR_T.2.B_Volume-2_June-2022p.pdf,

[2] Full quote at FEIS App'x T.2.B.Vol.2, p. CO-828: "Comments questioning certain throughput figures presented in the SDEIS, Appendix A were determined to have merit. While that Appendix presents over 1,500 figures (in Attachment G), these comments identified minor anomalies in that data that the agency re-evaluated in the course of preparation of the FEIS and supporting technical reports. Updated throughput tables are presented in the FEIS (Appendix A, sub-appendix G) and have addressed the concerns identified."

model issues. The response also demonstrates the need for and importance of outside expert scrutiny of traffic modeling, including assumptions, inputs, and outputs.

In order to review the traffic model, it is necessary for me to have access to the underlying data files upon which the model was based. The request to MDOT and FHWA for underlying data files has not been granted prior to the deadline for providing this comment to the FEIS. In a written response, MDOT suggested that such data would not be considered under NEPA but only as a Maryland Public Information Act request. Any data would only be released after the end of the availability period, if ever. This denial of underlying data during the FEIS availability period has severely hampered my review of the traffic model.

II. Overview of Comments

Despite lacking the data files to run and evaluate the model in detail, the material presented in the FEIS shows that the agencies have not corrected most of the significant problems identified in the previous review of the SDEIS,[3] but that the modeling has been substantially changed since the SDEIS was issued. Specifically, it appears that new serious errors have been introduced into the modeling process.

Some of the most fundamental rules about modeling appear to have been ignored, including making parameter changes after model validation, altering count inputs, running insufficient simulations for model convergence, and fitting one model to a different inapplicable one. These things cannot be verified without access to the underlying traffic model data.

Furthermore, generic reference to "design updates and the forecasting refinements" cannot explain the magnitude of change in the numbers between SDEIS and FEIS. Changes of this scale shown between SDEIS and FEIS require credible explanation, scrutiny, and an opportunity for meaningful comment by agencies and the public.

The foundation of any transportation modeling is a validated base year model. Future alternatives must be analyzed with the same validated model. In the FEIS, it appears that VISSIM model parameters were modified after the base year validation, which occurred in 2020, in order to make the modeled traffic metrics look better than they did in the SDEIS.

[3] Sierra Club et al. SDEIS Comments on I-495 & I-270 Managed Lanes Study, November 30, 2021, p. 19, https://www.sierraclub.org/sites/www.sierraclub.org/files/sce/maryland-chapter/2021-12-27%20-%20Sierra%20Club%20et%20al.%20SDEIS%20comments.pdf "Flaws in the Metropolitan Washington Council of Governments ("MWCOG") model include that it: (1) does not constrain traffic flow to capacity; (2) does not properly feed congested travel times back to non-work trip destinations; (3) assumes no increased traffic from road expansion; (4) fails to accurately forecast bottlenecks; (5) cannot calculate net congestion tradeoffs; and (6) cannot accurately model peak period conditions. It then takes these flawed "demand" estimates and inputs them into a capacity constrained VISSIM model that is overwhelmed and produces erroneous output."

Changing parameters after model validation is an invalid practice. Whether that was done needs to be analyzed and requires access to the underlying files. The other notable errors also merit further scrutiny, necessitating provision of the underlying data files.

Establishing the traffic model's validity is paramount, because the significant throughput changes and the sometimes doubling of travel time savings between SDEIS and FEIS may mask model errors the significantly underestimate congestion and bottlenecks, and thereby minimize or erase in the public record the extent of the significant adverse impacts associated with air quality, noise, environmental justice, and more. If the model's validity is not verified, invalid modeling will be the basis of a 50-year private toll lane concession that will set in motion a chain of highway expansions and associated environmental degradation and community impacts.

III. Discussion

A. MDOT's Withholding of Modeling Data Precludes Complete Review of the Traffic Models Used in the I-495 and I-270 FEIS

The FEIS modeling includes a sequence of three models:

1) the MWCOG regional model
2) a subarea model using VISIM software (introduced for the first time in the FEIS), and
3) a VISSIM microsimulation model.

Transportation models are very complicated, and none of these models are completely documented in the FEIS. The only way that the underlying assumptions and parameters can be completely reviewed is by looking "under the hood" at the modeling files. I

In my work over the past 34 years reviewing environmental documents for transportation projects, I routinely request and receive modeling files and other underlying documentation relating to traffic models. Repeated requests for these modeling files and additional documentation have been made for the models that were the basis for previous draft environmental impact statements and for all three models used as the basis for the FEIS. Most recently a request to MDOT copied to FHWA for the data was made on June 29, 2022 (see Appendix A). On July 1, MDOT State Highway Administration's Public Information Act manager wrote, "We are advising you that we do not anticipate providing these records to you within the first 10 business days (see message in Appendix B). On July 14, 2022, four days before the end of the availability period, MDOT SHA issued a letter saying the files could not be looked for until receipt of $21,795.81. MDOT has failed to provide this critical underlying data. My ability to meaningfully comment on the traffic model is therefore limited because I do not have access to this underlying data.

As we do not expect to receive these materials before the end of the comment period, we can only comment on the errors and serious deficiencies that are apparent in the FEIS. After we have reviewed the requested files, it is likely that we will identify additional problems.

A. Flaws in the FEIS Traffic Model

1. The VISSIM Modeling Parameters Are Critical and Are Not Documented

I comment first on errors and deficiencies in the VISSIM model with a focus on the northbound afternoon peak hour bottleneck that the project would create on the Inner Loop. VISSIM is commercial microsimulation software sold by the German company PTV. It represents the behavior of individual vehicles, and the visual simulations can look very realistic. However, the FEIS's primary performance metrics – speed/travel time and vehicle throughput –depend heavily on driver behavior parameters that are commonly changed from the VISSIM defaults and that are hidden from view.

The Maryland Department of Transportation State Highway Administration (MDOT SHA) Travel Forecasting and Analysis Division (TFAD) has issued guidance for the application of VISSIM in roadway planning in Maryland.[4] This guidance document states:

> Modelers are encouraged to develop driver behavior models in addition to the default VISSIM driver behavior models. Each corridor is unique and driver behavior models should reflect these patterns; however, TFAD recently performed a Driving Behavior assessment, discussed below, which could help modelers during the VISSIM calibration process. Recommended ranges for behavior models are also discussed in this section. (p. 3)

The paragraph is followed by seven pages of detailed recommendations for these driver behavior parameters, including:

- standstill distance – desired distanced between the rear-bumper to front bumper of stopped cars
- headway time – the distance in seconds the following driver desires to maintain with the lead vehicle
- following variation – how much more distance that the desired safety distance before the lagging driver intentionally moves closer to the lead vehicle

[4] Maryland Department of Transportation State Highway Division. VISSIM Modeling Guidance, updated August 2017. https://www.roads.maryland.gov/OPPEN/VISSIM%20Modeling%20Guidance%209-12-2017.pdf

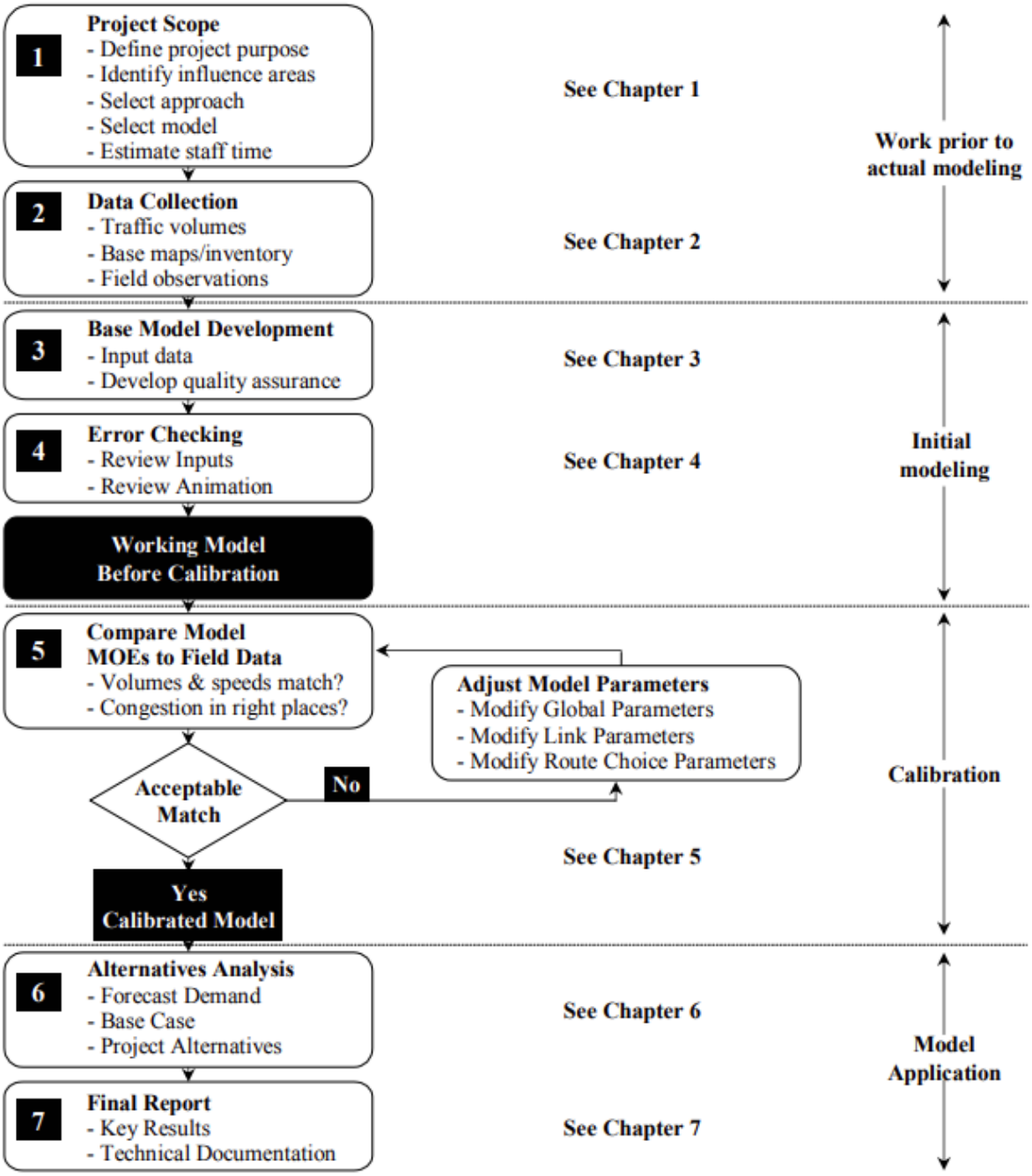
- advanced merging – vehicles change lanes upstream of a congested on-ramp to allow more vehicles from the ramp to merge to the mainline, thus increasing capacity and reducing the likelihood of stopped vehicles waiting for a gap
- safety distance reduction factor for lane changes – safety distance of the trailing vehicle on the new lanes the safety distance of the land
- static routing decisions – to limit excessive lane changing
- cooperative lane change
- waiting time for diffusion – the maximum amount of time a vehicle will wait or stop for a necessary lane change before it is removed from the network [note: this is a peculiar but necessary element of traffic microsimulation modeling to prevent vehicles from being stuck in the network forever – it is like a helicopter sweeps in and lifts a vehicle out of traffic]
- maximum deceleration for cooperative braking – to what extent the trailing vehicle is braking cooperatively in order to allow the preceding vehicle in the adjacent lane to perform a lane change and enter the lane in which the trailing vehicle is traveling

All these parameters affect the FEIS speed/travel time and vehicle throughput metrics and the different parameter ranges recommended by MDOT SHA would produce a wide range of possible outputs. The guidance document shows a 20% reduction in throughput between “Freeway Basic Conservative I” and “Freeway Aggressive I” parameters and a 30% reduction in throughput between “Freeway Basic Conservative II” and “Freeway Aggressive II.” 30% is a huge difference, almost as great as the difference between 3 lanes and 4 lanes of traffic (+33%).

Given that different parameters produce wildly different performance metrics, it is only possible to have confidence in traffic microsimulation model outputs if the model is well calibrated to real-world base year data and that these validated parameters are maintained in all alternatives analyses.

Figure 1, reproduced from a Federal Highway Administration guidance document, shows this clearly. In the figure, Calibration Step 5 appropriately includes iteratively adjusting parameters until the desired model fit is achieved. After Step 5, these parameters must be left unchanged in the Alternatives Analysis Step 6. This procedure of freezing the parameters does not appear to have been followed given the magnitude of changes between the SDEIS and FEIS.

Figure 1: Federal Highway Administration Guidance on Microsimulation Model Development[5]



Developed by the FHWA Traffic Analysis Tools Team and later adapted from *Advanced Corsim Training Manual*, Short, Elliott, Hendrickson, Inc., Minnesota Department of Transportation, September 2003.

Figure 1. Microsimulation model development and application process.

[5] Federal Highway Administration. Traffic Analysis toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software, 2004.

Appendix D of FEIS Appendix A is the VISSIM Calibration Report. It is dated December 18, 2020, and supersedes an earlier calibration effort documented in Appendix D of DEIS Appendix C. December 18, 2020 was prior to the release of the SDEIS; therefore, this second calibration must also be the basis for the SDEIS modeling although this second calibration is not discussed in the SDEIS.

The FEIS VISSIM Calibration Report states that the calibration work included changes to driver behavior parameters, link behavior types, and lane changing distances. FEIS at Appendix A, 618 of 800.[6] However, no specifics are given. As discussed above, MD SHA VISSIM guidance indicates that changes in these parameters can result in variations in throughput as great as 30%.

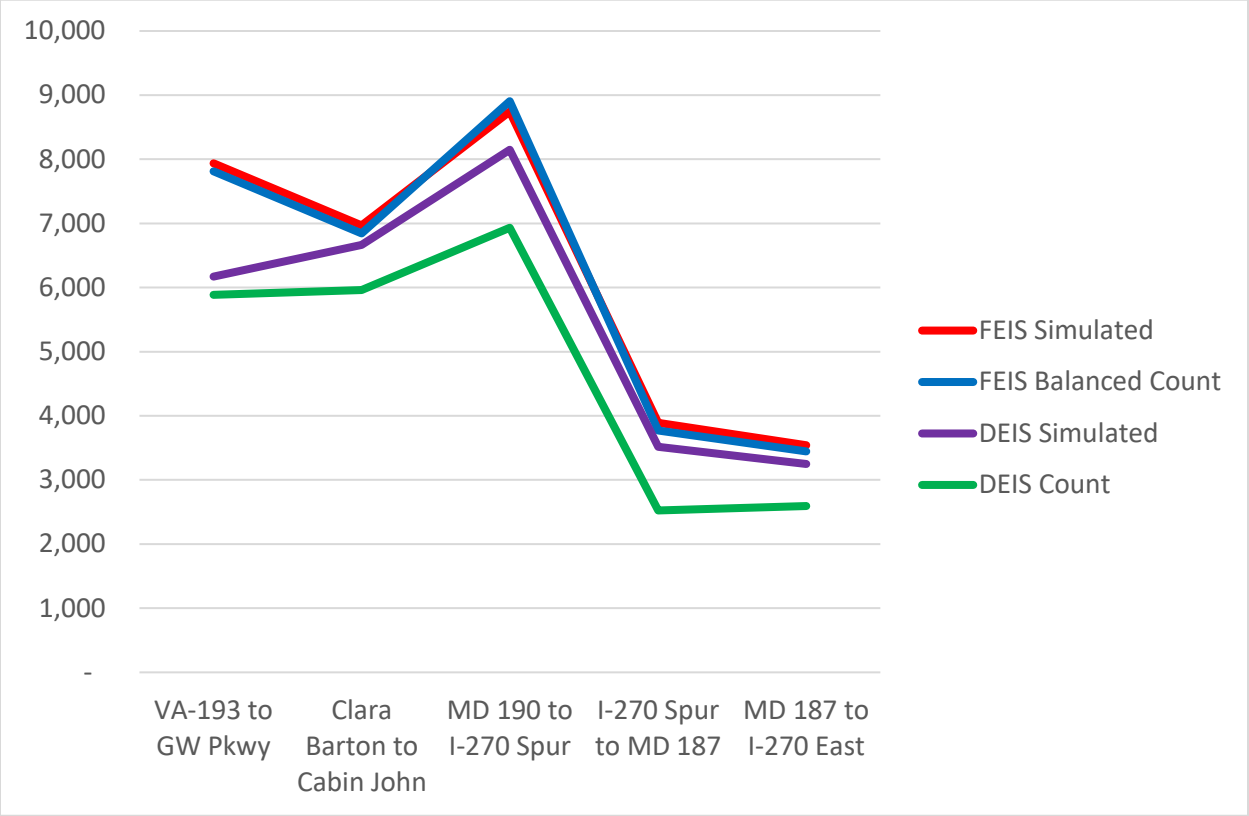
Without having access to the documentation of the parameters, we can't be confident that the model is valid.

2. The Second VISSIM Calibration Included Large Unexplained Changes to 2017 Traffic "Counts"

This second calibration fits data better than the first calibration. However, the better fit appears to be achieved by changing the data rather than by changing the simulated volumes (Figure 2).

[6] The appendix pages are not numbered after page 94 which is why the numbers are given in this format.

Figure 2: Northbound Inner Loop 5-6 p.m. DEIS and FEIS Count Data and Simulated Volumes



As shown in the figure above, the FEIS simulated volume tracks very closely to the FEIS "balanced count" but the simulated volumes did not change nearly as much between the DEIS and the FEIS as the "counts" did. Changing the data significantly at this point in the process after the calibration step would need to be disclosed and justified. As shown in Figure 1 above, there is no arrow in the model development process from Step 5 Calibration to Step 2 Data Collection.

The likely explanation for the better fit with the revised data is that the FEIS counts are "balanced counts", i.e., that they are the output of a spreadsheet type model. In this case, the FEIS modelers may be (at least in part) fitting one model to another model rather than to actual data. Any model, including a model that creates balanced traffic counts, can then be manipulated to achieve desired results.

MDOT SHA VISSIM guidance[7] (2017, p. 14) cautions strongly against the use of balanced counts in VISSIM model calibration:

> A frequent error is the use of the balanced traffic volume network for calibration of a VISSIM model. This is an incorrect calibration method.

[7] Maryland Department of Transportation State Highway Division. VISSIM Modeling Guidance, updated August 2017. https://www.roads.maryland.gov/OPPEN/VISSIM%20Modeling%20Guidance%209-12-2017.pdf

> Calibration should not be made using the demand volume (i.e. the balanced volume network), rather they should meet the throughput measured in the field (i.e. raw data count). [Note: the underlining is in the MDOT SHA document.]

The FEIS's use of balanced counts ignores MDOT's own guidance. The decision to use balanced counts should have been explained and justified in the FEIS. Having the underlying data files would have permitted further elaboration on this issue.

3. The VISSIM Modeling Appears to Rely on Invalid Parameter Adjustments

My comments on the SDEIS assumed that the existing condition 2017 VISSIM calibration and performance metrics were identical between the DEIS and the SDEIS because this second calibration was not disclosed in the SDEIS. The SDEIS comments (p. 18-19) therefore wrote:

> The most congested I-495 segment today is northbound in the inner loop in the afternoon peak hour, where the managed lanes end (documented in Appendix C). If the managed lanes are extended into Maryland, the most critical section similarly will be northbound in the afternoon peak hour upstream of end of the managed lanes. Severe bottlenecks will be created by the proposed project where managed lane traffic will have to merge with the general-purpose lane traffic. The SDEIS acknowledges the presence of these bottlenecks, stating: "Congestion would be present during the PM peak period on the 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. . ." SDEIS at 2-6.
>
> The SDEIS fails to acknowledge that that project would greatly worsen these bottlenecks but illustrates the bottleneck in the throughput metric. The SDEIS states: "Throughput represents the number of vehicles that pass by a given point in the roadway network in a set amount of time. SDEIS at 3-13. The throughput numbers presented in the SDEIS indicate that throughput in this section in the afternoon peak period in 2045 would be much lower than today whether the project is constructed or not.
>
> Figures 1 and 2 show throughput numbers for 5-6 p.m. and 6-7 p.m., respectively. The 2017 existing volumes are from the DEIS Appendix C and the 2045 No Build and Alternative 9G numbers are from SDEIS Appendix C.[8]

[8] Sierra Club et al. SDEIS Comments on I-495 & I-270 Managed Lanes Study, November 30, 2021, pp. 18-19, https://www.sierraclub.org/sites/www.sierraclub.org/files/sce/maryland-chapter/2021-12-27%20-%20Sierra%20Club%20et%20al.%20SDEIS%20comments.pdf

These figures from our SDEIS comments are reproduced below as Figures 3 and 4.

Figure 3: Northbound Inner Loop Throughput 5-6 p.m. – 2017 from DEIS, 2045 from SDEIS

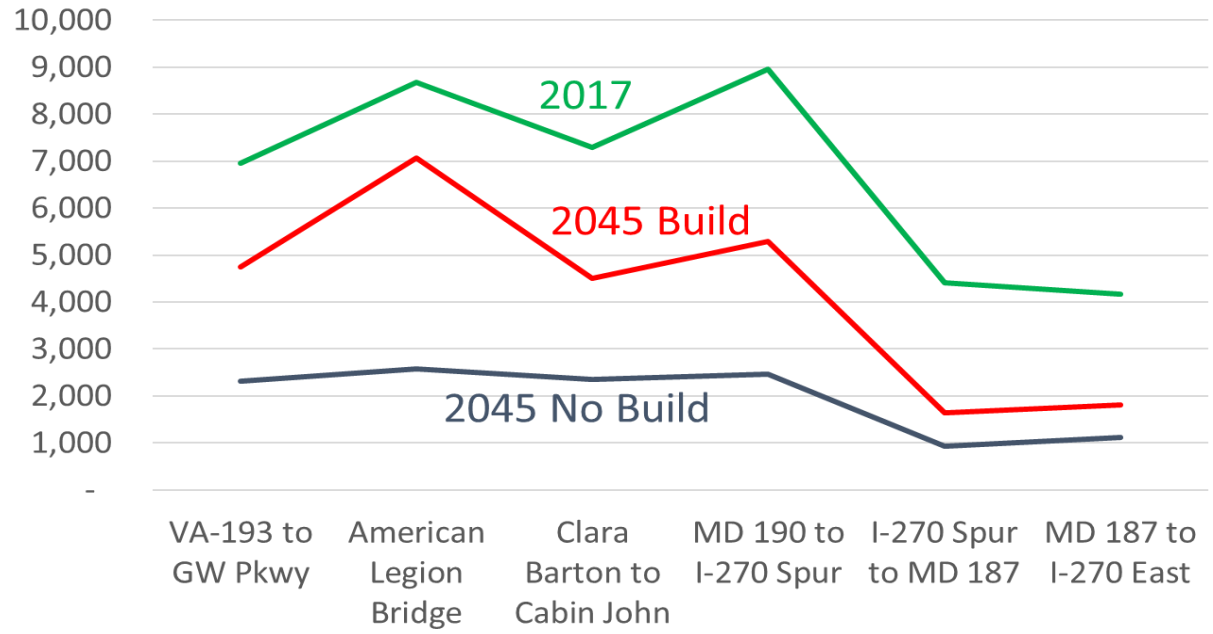
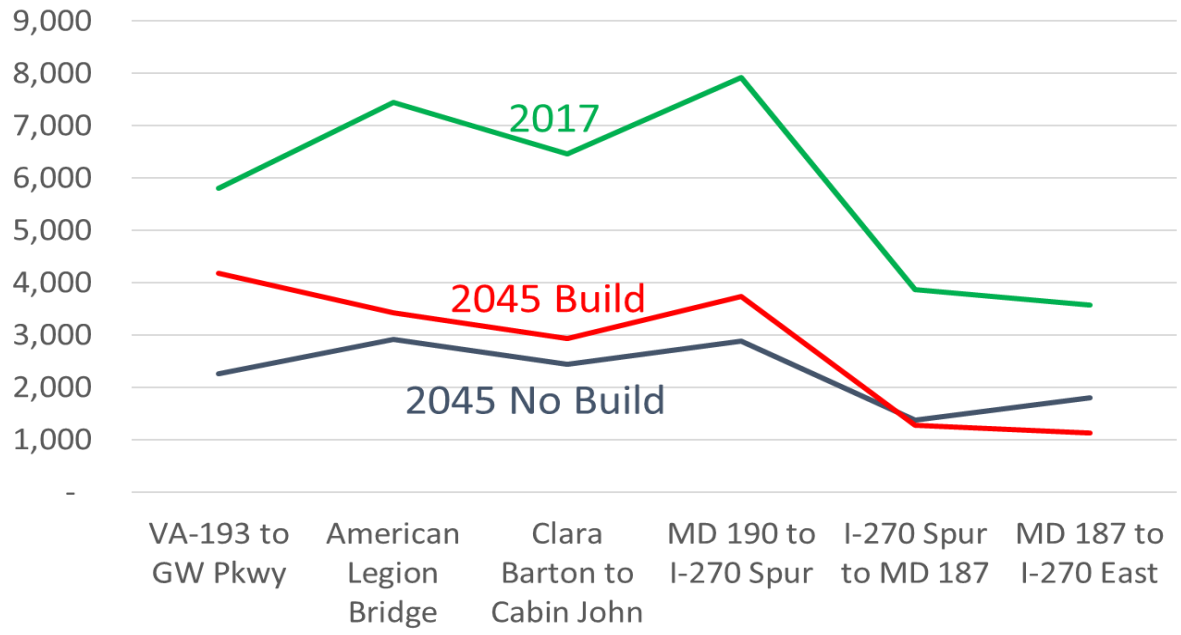


Figure 4: Northbound Inner Loop Throughput 6-7 p.m. – 2017 from DEIS, 2045 from SDEIS



All these numbers are significantly different in the FEIS. Figures 5 and 6 compare SDEIS and FEIS 2045 No Build throughput.

Figure 5: Northbound Inner Loop Throughput 5-6 p.m. FEIS 2045 No Build from Appendix A, p. 746 of 800

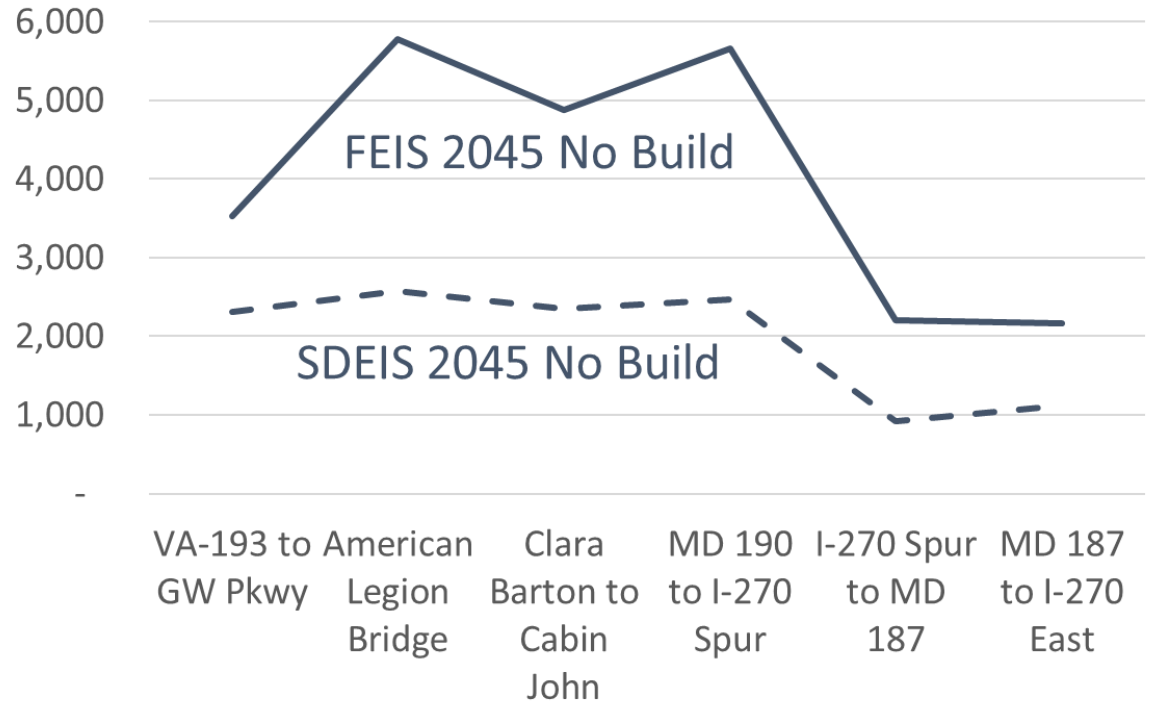
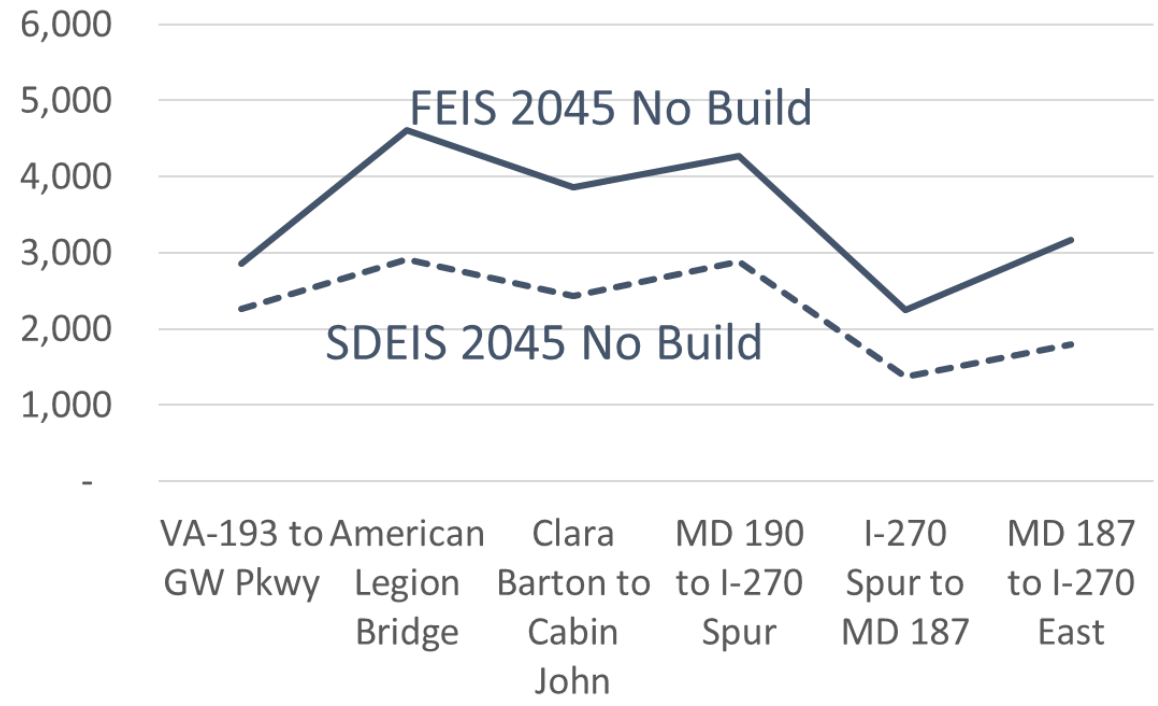


Figure 6 Northbound Inner Loop Throughput 6-7 p.m. FEIS 2045 No Build from Appendix A, p. 746 of 800



The large increases in 2045 No Build alternative throughput between the SDEIS and the FEIS shown in Figures 5 and 6 are evidence of a serious problem because:

1) The input demand between the SDEIS and FEIS is almost identical, varying by no more than 2% in either of the peak hours for any of the road segments.
2) The No Build highway networks in the SDEIS and FEIS are almost identical.
3) Nevertheless, the FEIS throughput is much higher than the SDEIS throughput. In the 5-6 p.m. hour, the FEIS throughput is over twice the SDEIS throughput for the middle four road segments.

The only plausible explanation is that the VISSIM model parameters are different between the SDEIS and FEIS simulations. As discussed above, MDOT SHA VISSIM guidance describes parameter sets that result in throughput differences of up to 30%. However, as has been documented above, both the SDEIS and FEIS should rely on the same December 2020 base year calibration. If the parameters have been changed after that base year calibration was completed, this would violate the most basic principle of traffic modeling – that the alternatives modeling use a model validated with data. Any alternatives modeling with parameters modified after validation was completed would be invalid.

Throughput for the Preferred alternative also is significantly higher in the FEIS than in the SDEIS as shown in Figures 7 and 8.

Figure 7 Northbound Inner Loop Throughput 5-6 p.m. FEIS 2045 Preferred from Appendix A, p. 754 of 800

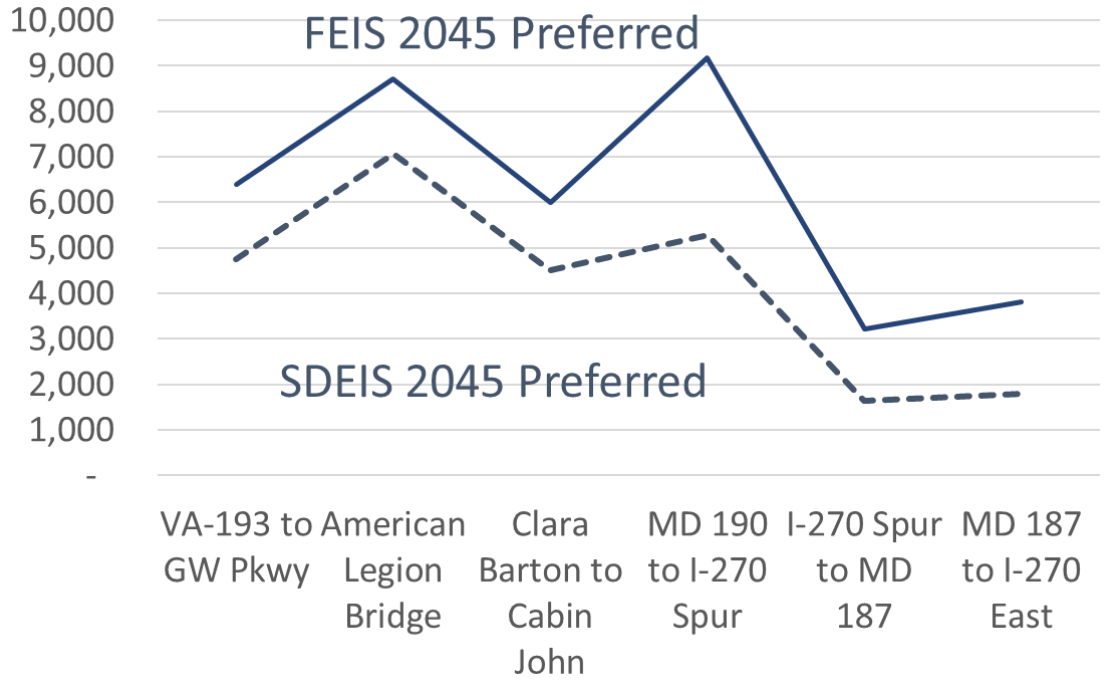
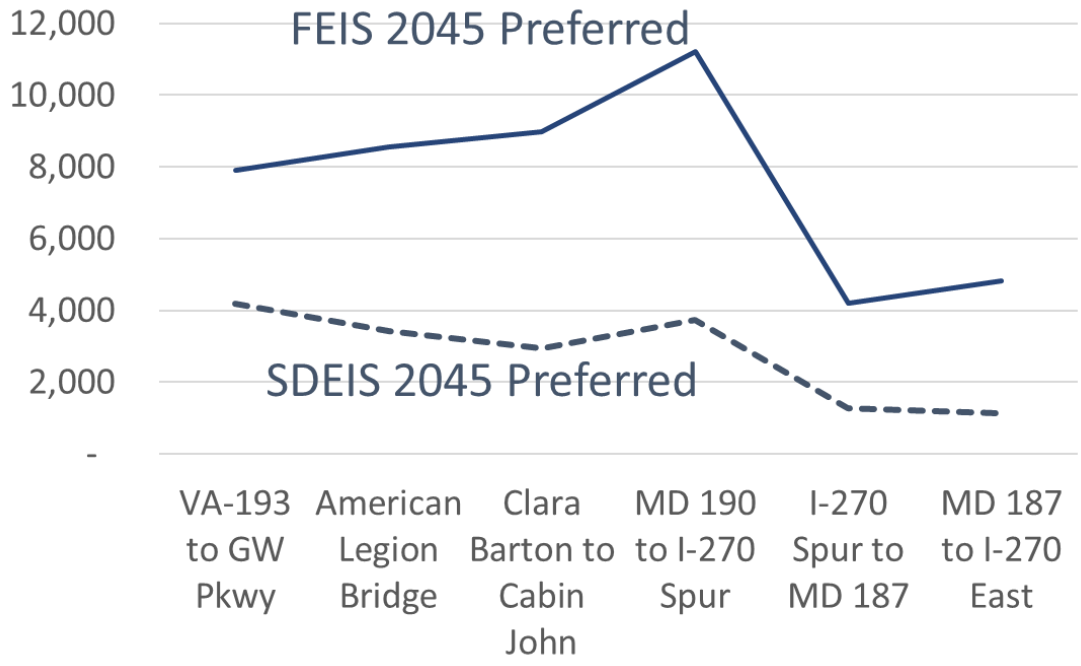


Figure 8: Northbound Inner Loop Throughput 6-7 p.m. FEIS 2045 Preferred from Appendix A, p. 754 of 800



The FEIS attempts to explain the improvement in performance of the Preferred alternative between the SDEIS and the FEIS this way:

> The design updates and the forecasting refinements to the Preferred Alternative since the SDEIS show additional operational improvements. For example, the HOT lanes are now projected to achieve the desired speeds of 45 miles per hour (mph) or better during the peak hours, as reported in chapter 4, Section 4.3.1. The projected operations on the inner Loop of I-495 show an improvement over the SDEIS analysis – the average speed in the general purpose lanes during the PM peak hour was 7 mph in the SDEIS, whereas the FEIS traffic analysis shows speeds are around 15 mph; the congestion does not extended as far back along the mainline; and the results are more consistent with what VDOT was reporting for the 495 NEXT project. (FEIS, p. ES-17)

These changes are insufficient to cause this large an improvement in throughput. Instead, it is much more likely that parameter changes are the primary cause of the apparent improvement. If the VISSIM parameters have changed since the model validation, the Preferred alternative modeling is invalid.

The FEIS excerpt noted above also suggests that consistency with the VDOT 495 NEXT project is desirable. This is not a valid objective. The NEXT study area extended only as far north as River Road and the Cabin John interchange[9] and therefore could not evaluate the bottleneck that this project would cause farther north. Any attempt to improve consistency with the NEXT modeling would be fitting one model to a different and inapplicable model.

Fitting the model to the NEXT model should not have been done, but if it was, it should have been disclosed clearly and not just alluded to as it is above. The Agencies' ambiguous language deprives the public and agencies of the ability to understand and verify what was done.

4. The VISSIM Model Does Not Appear to Use Enough Simulations for Model Convergence

Another fundamental issue in traffic microsimulation modeling is that any single simulation is influenced by thousands of random calculations intended to reflect random traffic arrivals as well as a range of driver behavior in separate vehicles. For this reason, it is necessary to average multiple simulations for reliable and comparable results. The MDOT SHA guidance[10] states:

[9] Virginia Department of Transportation. I-495 Express Lanes Northern Extension Environmental Assessment, February 2020, p. 2-10 - 2.11.

[10] Maryland Department of Transportation State Highway Division. VISSIM Modeling Guidance, updated August 2017. https://www.roads.maryland.gov/OPPEN/VISSIM%20Modeling%20Guidance%209-12-2017.pdf

> A minimum of 5 simulation runs must be completed before average outputs of all runs can be used for analysis. Additional runs may be necessary, up to 15 runs or by showing convergence of the model. (p. 14)

The FEIS states that each simulation was done 5 times (FEIS Appendix A at 54 of 800), i.e., the minimum required by MDOT SHA. In heavily congested simulations, it generally is necessary to average more than 5 simulations. The report does not demonstrate that 5 simulations is sufficient for convergence.

They did not document having reached convergence in the report, and so there can be no confidence that convergence was achieved.

If we had the underlying data files, we could have analyzed whether convergence was achieved.

5. The VISSIM Modeling Invalidly Shows Future Throughput Much Lower Than Existing

Figures 9 and 10 show the Existing 2017 throughput from the FEIS along with the SDEIS and FEIS 2045 No Build throughput.

Figure 9: Northbound Inner Loop Throughput 5-6 p.m.

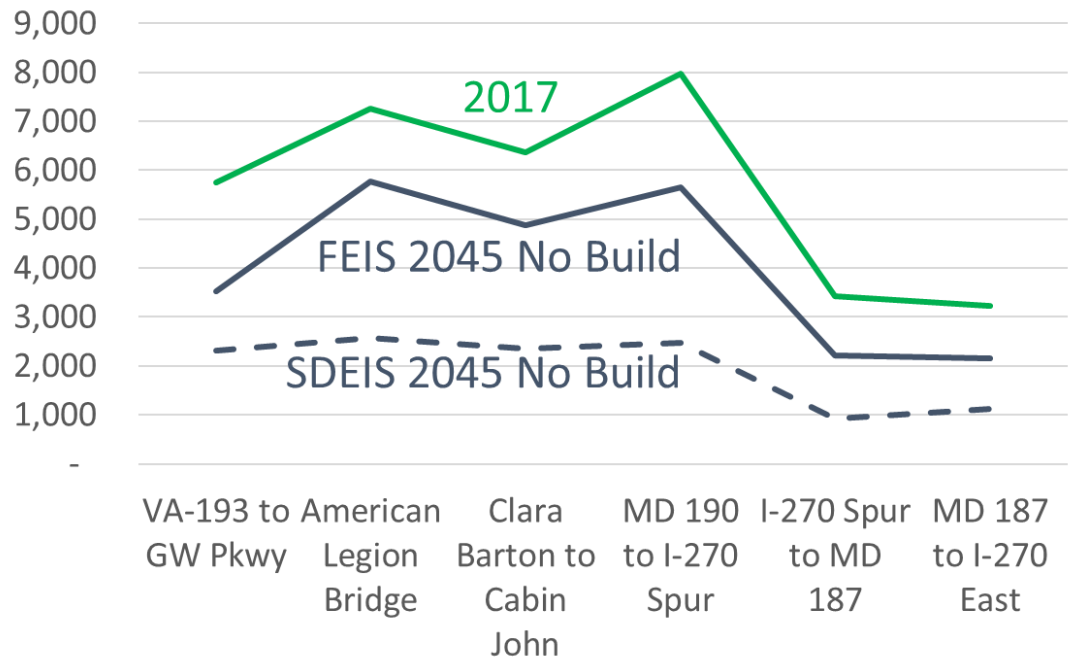
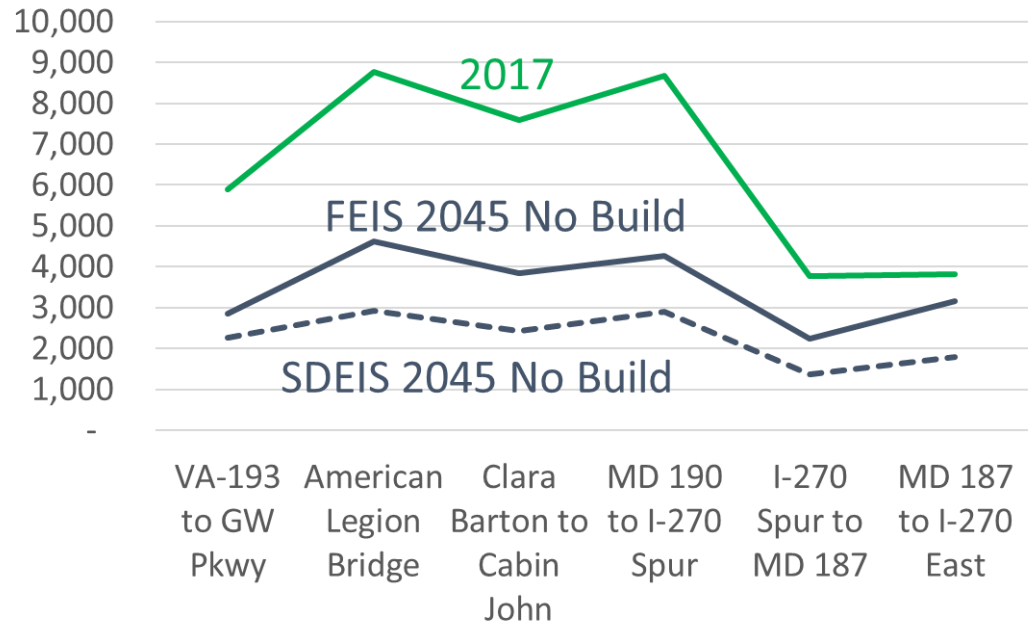


Figure 10 Northbound Inner Loop Throughput 6-7 p.m.



In the figures above, the FEIS No Build alternative throughput is considerably higher than in the SDEIS, but it still is much lower than the existing volumes. In our SDEIS comments (p. 22), we wrote:

> There is no real-world rationale for future throughput being significantly lower than today. Without widening, throughput will be very similar to today because the road is already congested. With widening, throughput also will be very similar to today because traffic flow will be metered by the downstream bottlenecks. The SDEIS compares two sets of wrong 2045 throughput numbers and presents the difference between them as a performance metric. This is invalid.[11]

We continue to argue strongly that modeled future throughput that is significantly lower than existing throughput is invalid. This error is not addressed or rebutted in the FEIS responses to our SDEIS comments.

Very low microsimulation travel speeds that unduly suppress throughput are indicative of gridlock and such models should not be used for alternatives analysis. The FHWA guidance document on traffic microsimulation modeling states:

> Ensure models are stable and do not create unrealistic gridlock conditions, as this will create artificial (and dramatic) variation in outputs.[12]

This conclusion is somewhat conjectural because we have not been provided with the VISSIM model files, but nonetheless, it is highly probable that the unrealistically low throughput numbers indicate the presence of the "unrealistic gridlock conditions" that FHWA guidance warns about.

6. The FEIS Continues to Falsely Insist That There Is Some Increasing "Demand" That Exists Independent of Actual Traffic Volumes

This gridlock is caused in the VISSIM model by inputting unrealistically high traffic volumes. In our SDEIS comments (p 38 to 51), we wrote:

> The SDEIS framing of "demand" vs. "throughput" is fundamentally wrong. Demand is not a point, as anyone who has taken Economics 101 has had hammered into them repeatedly; demand is a curve with more demand when the price is lower and less demand when the price is higher. For un-tolled roads, this "price" is primarily based on the value of travel time. The generalized price for toll roads includes both cost and time. . . (p. 38)

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[11] Sierra Club et al. SDEIS Comments on I-495 & I-270 Managed Lanes Study, November 30, 2021, p. 22, https://www.sierraclub.org/sites/www.sierraclub.org/files/sce/maryland-chapter/2021-12-27%20-%20Sierra%20Club%20et%20al.%20SDEIS%20comments.pdf

[12] Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software 2019 Update to the 2004 Version, https://ops.fhwa.dot.gov/publications/fhwahop18036/chapter6.htm

> The dichotomy put forward in the SDEIS of “demand” vs “throughput” does not exist. There are only traffic volumes at the equilibrium point. The volume V_0 represents the point on the demand curve where the cost equals P_0. The “throughput” should equal this equilibrium traffic volume. . . (p. 39)
>
> In fact, traffic can be expected to grow little in the project corridor if the roadway is not widened, but likely will grow significantly if it is widened. (p. 51)

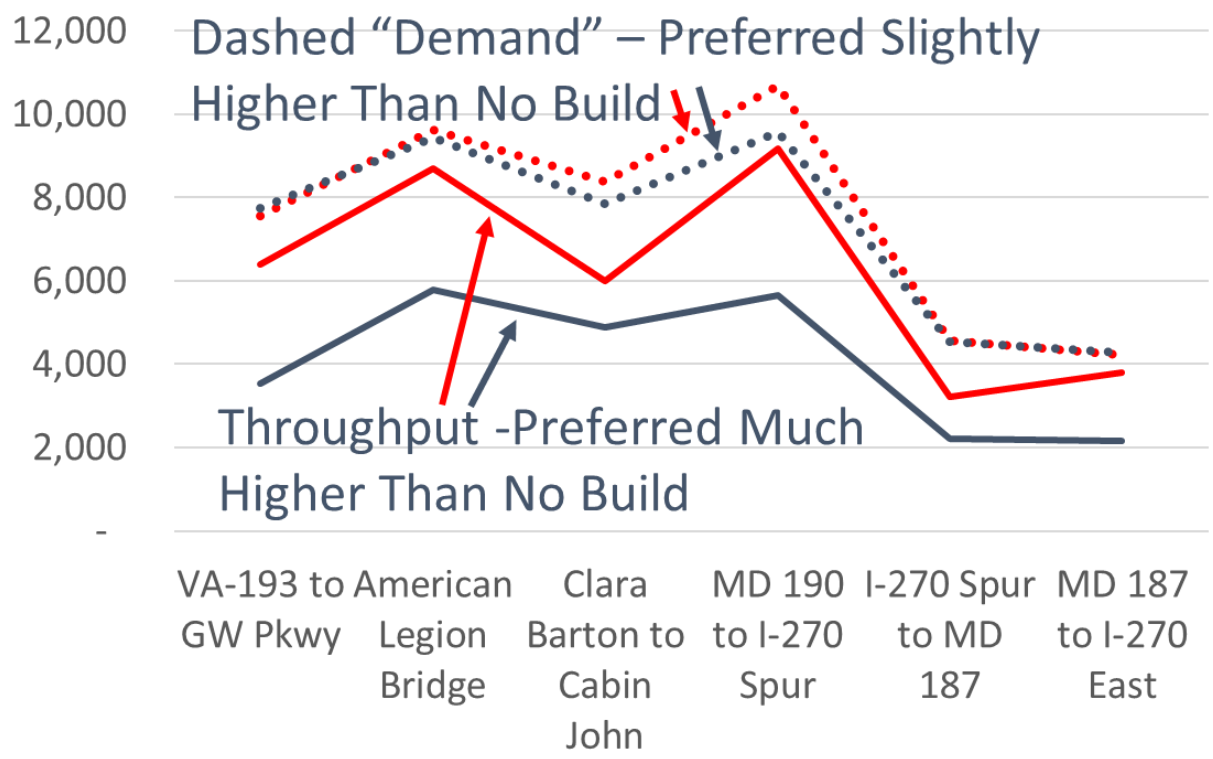
Our SDEIS comments were based on economic and engineering theory. In contrast, the FEIS relies on flawed models that are inconsistent with theory. The FEIS improperly (and nonsensically) combines future traffic “demand” that is much higher than today with future traffic “throughput” that is much lower than today.

Rather than accepting the limitations of the bad models, the FEIS continues to double down on this absurd combination of unrealistically high “demand” and unrealistically low “throughput”. Part of the FEIS response to our comments is:

> . . . the comment extrapolates that the MLS analysis should have assumed zero growth for the No Build Alternative as a result of likely gridlock conditions. This is an unreasonable assumption in light of clear projected increases in regional population and employment that can certainly increase demand for mobility, even if congestion conditions worsen under the No Build scenario. (FEIS at Appendix T.2.B.Vol.2 at CO-827)

The FEIS remains confused as to the nature of “demand.” As we pointed out in our SDEIS comments and is reproduced above, demand is a curve and not a point. We demonstrated this, in part, with excerpts from an FHWA document. We never said that this demand curve could not shift. We said that peak period traffic volumes could not increase significantly without expansion. Ironically, the FEIS demonstrates this in an exaggerated way by showing lower future throughput than today. If the DEIS version of “demand” can never be accommodated on roadways or even in an FEIS model as is shown in Figure 11, it is a meaningless concept.

Figure 11: Northbound Inner Loop 5-6 p.m. FEIS "Demand" vs. Throughput for No Build and Preferred Alternatives



Although "demand" in the FEIS is a meaningless concept, as discussed above, inputting these unrealistic numbers into the VISSIM model causes gridlock in the model and unrealistically low throughput. It is a case of "garbage in – garbage out." As shown in the figure, the problem is especially bad for the No Build alternative but also is present in the Preferred alternative modeling.

7. The Introduction of a Third Model in the FEIS Does Not Solve the Problems with the Other Two Models

In the SDEIS, the unrealistically high traffic "demand" was derived from the MWCOG regional travel demand model. In our SDEIS comments (p. 25) we wrote:

> The MWCOG model capacity is, as is stated in the modeling reference the "maximum volume that should be assigned to a link by the forecasting model." Assigned volumes that except capacity are errors and assigned volumes that greatly exceed capacity are serious model errors.
>
> In the DEIS, many segments of I-495, I-270 and other roads are located with v/c [volume to capacity ratio] greater than 1.1. . . The DEIS not only does publish

these modeling results and uses them for planning, but even goes so far as to represent these over-capacity assignments as a performance measure.[13]

In the FEIS, a third subarea VISUM model is introduced in between the MWCOG model and the VISSIM model. While it appears that this has improved the fit between traffic counts and base year model inputs, the VISUM model has the same inherent problems as the MWCOG model. Traffic growth is similarly unconstrained to capacity and future modeled traffic volumes (which the FEIS labels “demand”) are as a result much too high.

As noted above, the 2045 No Build traffic demand in the bottleneck area discussed above are almost identical between the SDEIS and the FEIS. Both the SDEIS and FEIS inputs for the No Build to the VISSIM model are unrealistically high due to the unconstrained traffic growth in the MWCOG and VISUM models. As discussed above, inputting over-capacity traffic volumes into the VISSIM microsimulation model causes gridlock in the model and results in unrealistically low speeds and throughput. This was shown in the 2045 No Build throughput being lower than the existing (2017) (see Figures 9 and 10).

[13] Sierra Club et al. SDEIS Comments on I-495 & I-270 Managed Lanes Study, November 30, 2021, p. 25, https://www.sierraclub.org/sites/www.sierraclub.org/files/sce/maryland-chapter/2021-12-27%20-%20Sierra%20Club%20et%20al.%20SDEIS%20comments.pdf

8. History is a Better Guide Than Invalid Modeling to the Impacts of the Proposed Project

Our SDEIS comments documented the reasonably foreseen impacts of constructing the managed lanes based on experience in Maryland and Virginia. These impacts are summarized in Table 1.

Table 1: Reasonably Foreseen Impacts of Constructing the Managed Lanes

Impact	Basis
1) Shifts traffic from the shoulder hours into the peak hours and creates and/or exacerbates bottlenecks	Worst bottleneck on I-495 in Virginia was created where the managed lanes end[14] [15]
2) General-purpose lanes will be just as congested during the peak hours as they would have been otherwise	Virginia experience[16]
3) likely to make arterial congestion worse	Virginia experience[17] [18]
4) Induced travel growth	I-270 widening in Maryland[19] [20] [21] and examples throughout the U.S.
5) Managed lanes will only carry about 1/6 of traffic volume	Virginia experience[22]

[14] Lazo, Luz. Virginia begins last piece of Beltway toll lanes expansion, reaching the American Legion Bridge. Washington Post. October 7, 2021, https://www.washingtonpost.com/transportation/2021/10/07/virginia-beltway-express-lanes-expansion/
[15] Butler, Debra, Opinion: Use Caution. I-495 Toll Lanes Not as Advertised, January 14, 2022, https://www.marylandmatters.org/2022/01/14/opinion-use-caution-i-495-toll-lanes-not-as-advertised/
[16] Bell, Elisa, Transurban. 495 and 95 Express lanes: Customer choice regional benefit. Presented as part of the Transportation Research Board's Webinar on Ensuring Equity with Priced Managed Lanes in April 2019. http://onlinepubs.trb.org/onlinepubs/webinars/190429.pdf
[17] Trompeter, Brian. Residents fume over I-495 shoulder lane in McLean, InsideNova, January 16, 2018. https://www.insidenova.com/news/arlington/residents-fume-over-i-495-shoulder-lane-in-mclean/article_da2f87a2-f871-11e7-8a7b-a7b93e288cea.html
[18] VDOT. I-495 Auxiliary Lane Study, May 9, 2018. https://www.virginiadot.org/projects/resources/NorthernVirginia/I-495_study_handout_5-9-18.pdf
[19] [19] Sipress, Alan. Md.'s Lesson: Widen the Roads, Drivers Will Come. *Washington Post*, January 4, 1999. https://www.washingtonpost.com/wp-srv/digest/traffic4.htm
[20] National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, "Comparison of 1984 Study Forecasts with Most Recent Data: I-270 Corridor, June 18, 2001.
[21] National Capital Region Transportation Planning Board and Metropolitan Washington Council of Governments. Induced Travel: Definition, Forecasting Process, and a Case Study in the Metropolitan Washington Region, September 19, 2001. https://www.mwcog.org/documents/2001/09/19/induced-travel-definition-forecasting-process-and-a-case-study-in-the-metropolitan-washington-region-travel-forecasts/
[22] Commonwealth of Virginia Department of Transportation Average Daily Traffic Volumes with Vehicle Classification Data on Interstate, Arterial and Primary Route 2019. https://www.virginiadot.org/info/resources/Traffic_2019/AADT_PrimaryInterstate_2019.pdf

6) High toll rates will price most travelers out	Virginia experience[23] and FEIS rates of up to $5.64 per mile for passenger vehicles ($3.76 per mile with E-Z Pass) in 2021 $ + escalation that likely will exceed the rate of inflation FEIS as 3-27 – 3-28
7) Operator will maximize revenue rather than serving the public interest	Allowed rates are so high that the operator can "jam and harvest", i.e., the operator can intentionally increase congestion to maximize profit using industry algorithms[24]

The induced travel growth (#4) also will result in more energy use, greenhouse gas emissions, and air pollution if the project is constructed.

IV. Conclusion

While a detailed analysis is hindered by the Agencies' failure to provide the underlying traffic model data used in the FEIS, even with the data presented in the FEIS, it is possible to detect serious errors that appear to invalidate the model outputs. Those outputs, some of them illogical, appear to overstate travel time savings and inadequately capture congestion, gridlock conditions, and bottlenecks.

These outputs then lead in turn to significantly understated project harms and significantly overstated project benefits. The model output from the flawed analyses improperly and significantly underestimate harms associated with increased VMT, congestion, and bottlenecks on air quality, noise, environmental justice impacts, and more.

The multiple errors and missteps - including making parameter changes after model validation, altering count inputs, using balanced counts, fitting one model to a different inapplicable one, running insufficient simulations for model convergence, and reporting invalid throughput estimates that are lower than today – could have been verified if the underlying data files had been provided as was legally required (see footnote 3 and Appendix A).

[23] Lazo, Luz. Here's a look at who's using Northern Virginia's 495 and 95 Express Lanes, Washington Post, September 20 2018. https://www.washingtonpost.com/transportation/2018/09/20/heres-look-whos-using-northern-virginias-express-lanes/

[24] Phillips, Robert, Director of Pricing Research at Amazon, Presented at the University of California, Berkeley ITS Transportation Seminar, February 28, 2020. Video at: https://its.berkeley.edu/news/revenue-maximizing-dynamic-tolls

The abovementioned errors are serious and have real-world consequences. Illogical and defective outputs should not be the basis for state or federal decision making.

The FEIS attempts to explain the improvement in performance of the Preferred Alternative between the SDEIS and the FEIS as “design updates and the forecasting refinements.” The Agencies cite average speed in the general-purpose lanes during the PM peak hour as 7 mph in the SDEIS and 15 mph in the FEIS.

But these changes are insufficient to cause this large an improvement in throughput. Instead, it is much more likely that parameter changes are the primary cause of the apparent improvement. If the VISSIM parameters have changed since the model validation, the Preferred alternative modeling is invalid.

Changing parameters after model validation is an invalid practice. Whether that was done needs to be analyzed and requires access to the underlying files.

Making the kinds of changes that appear to have been made to the model after model validation would render the model invalid, and therefore invalid as a basis for decision-making.

V. APPENDICES

Appendix A
Letter Requesting Underlying Data Files for Traffic Model

Appendix B
MDOT SHA Response to Request for Traffic Model Underlying Data Files

Appendix C
MDOT SHA Fee Letter for Traffic Model Underlying Data Files

Appendix D
Norman Marshall CV

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Attorneys at Law

Jill Elise Grant
Phone: 202-821-1950
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June 29, 2022

Jeffrey T. Folden, PE, DBIA
Director, I-495 & I-270 P3 Office
Maryland Department of Transportation State
Highway Administration
707 North Calvert Street
Mail Stop P-601
Baltimore, MD 21202
495-270-P3@sha.state.md.us

Re: I-495 & I-270 Managed Lanes Study DEIS Traffic Files/Data

Dear Mr. Folden,

We request that MDOT provide the requested traffic spreadsheets and model files underlying its conclusions in the FEIS, no later than July 7, 2022. To do a full review of the traffic modeling in the FEIS, including understanding changes between the FEIS modeling and the SDEIS modeling, we require the following traffic modeling files and documentation:

1) VISSIM output files corresponding to the information presented in FEIS Appendix A (01_MLS_FEIS_AppA_Traffic-Tech-Report_June-2022p.pdf), Appendix H: Existing and Future Level of Service (p. 756-800)
2) All VISSIM input files required to recreate the outputs described in #1
3) VISSIM output files corresponding to the information presented in SDEIS Appendix A (SDEIS_AppA_Traffic-Evaluation-Memo_web.pdf), Attachment F: Link Evaluation (p. 145-177)
4) All VISSIM input files required to recreate the outputs described in #3
5) All reports, memorandum, letters and/or emails that describe VISSIM model development (in addition to the information provided in FEIS Appendix A). This should include documentation of the VISSIM model parameter changes and any other changes that were made between the publication of the DEIS in July 2020 and the publication of the FEIS in June 2022. This also should include documentation of how the VISSIM model develop process followed the Maryland Department of Transportation State Highway Department Vissim Modeling Guidance document.
6) MWCOG output files that correspond to the 2045 AM Peak Travel Demand and PM Peak Travel Demand tables for both the No Build and Preferred Alternative scenarios presented in FEIS Appendix A, p. 737-738.
7) All MWCOG model files (except for proprietary Cube software) required to recreate the outputs described in #6.
8) MWCOG output files that correspond to the 2045 AM Peak Travel Demand and PM Peak Travel Demand tables for both the No Build and Alt 9 Phase 1 Alternative scenarios presented in SDEIS Appendix A, p. 118-121.

9) All MWCOG model files (except for proprietary Cube software) required to recreate the outputs described in #8.
10) All reports, memorandum, letters and/or emails that describe the development of the 2045 travel demand numbers listed in #6 and #8 (in addition to the information provided in FEIS Appendix A). This should include documentation explaining why the numbers changed between the publication of the SDEIS in 0ctober 2021 and the publication of the FEIS in June 2022.
11) All reports, memorandum, letters and/or emails that describe the VISUM model base year and future year model development (in addition to the information provided in FEIS Appendix A).
12) VISUM base year, 2045 No Build and 2045 Preferred Alternative networks.
13) All reports, memorandum, letters, and/or emails that describe adjustments to the VISUM trip tables and assigned volumes (in addition to the information provided in FEIS Appendix A) that provides detail concerning the adjustments described in FEIS, p. 84 including: "adjustments required for base year calibration", "modified ratio adjustment method", "additional reviews to ensure individual O-D pair growth was reasonable" "extensive coordination and post-processing efforts, "reflected key trends from the regional travel demand model", and "aligning with previous and concurrent forecasting efforts for various locations within the project study area."
14) VISUM traffic assignment files for each analyzed hour for the base year, 2045 No Build and 2045 Preferred Alternative alternatives that link to the network files (#12).
15) All VISUM "peak hour correction matrices" described in FEIS Appendix A p. 84.

If you have any technical questions about this request, please contact our consultant:

Norm Marshall, President
Smart Mobility Inc.
nmarshall@smartmobility.com
802-356-2969

We request an expedited response for the following reasons. First, the underlying data requested is required to be disclosed publicly with the FEIS. 40 C.F.R. § 1500.1(b) (2019) ("NEPA procedures must ensure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA"); *id.* § 1502.21 (2019) (underlying data may be incorporated by reference only if "it is reasonably available for inspection by potentially interested persons within the time allowed for comment"); *WildEarth Guardians v. Mont. Snowmobile Ass'n*, 790 F.3d 920, 925 (9th Cir. 2015) ("To fulfill NEPA's public disclosure requirements, the agency must provide to the public 'the underlying environmental data' from which the [agency] develops its opinions and arrives at its decisions."). MDOT and FHWA's failure to provide this data before releasing the FEIS violates NEPA.

Second, this is not a request under Maryland's Public Information Act (PIA); rather, this is a request for data files that were required to be disclosed under NEPA. It is not subject to Maryland's PIA procedures.

In the past, MDOT has suggested that traffic modeling data is sufficiently disclosed when it is presented in tables of a PDF. As we have noted in prior correspondence with MDOT, final numbers presented in tables of a PDF cannot be substituted for the actual underlying spreadsheets and model files used to create those tables, which include formulas, calculations, and numbers that are not rounded. To reach their conclusions in the FEIS, the Agencies were not limited merely to numbers in tables of a PDF, and they cannot limit the public to that either.

Fourth, we request that fees be waived. This is not a request under Maryland's PIA but rather a request for documents that should have been disclosed in the first instance—thus no fee waiver request is necessary. We nonetheless note that a waiver would be appropriate under Md. Code Ann., GP § 4-206(e)

and Md. Code Regs. 11.01.13.13(A)(7); the non-profit organizations' ability to pay fees is constrained and the requested records are in the public interest and will enable the public to meaningfully comment on the FEIS's traffic conclusions. The public cannot evaluate the report fully without these documents, and furthermore these documents were required to be disclosed in the first instance. Providing the requested files simply requires copying and pasting computer folders to a Dropbox or other cloud-based folder and emailing the link. In fact, Smart Mobility has requested this same type of data many times for other highway EISs and has always been promptly provided it without charge. A non-exhaustive list includes:

1. Florida Department of Transportation District 1 – Collier County MPO RTP Update
2. Colorado Department of Transportation – I-70 East EIS
3. Berkeley Charleston Dorchester Council of Governments (South Carolina) – RTP Update and I-526 Extension
4. New York Department of Transportation – Hunts Point Interstate Access Improvement Project DEIS
5. Southern California Association of Governments – High Dessert Corridor DEIR
6. Arkansas Department of Transportation – I-30 Planning and Linkages Study
7. Utah Department of Transportation – West Davis Corridor DEIS
8. Texas Department of Transportation – RTP Update and South Mopac modeling
9. Charlottesville/Albemarle Metropolitan Planning Organization (Virginia) – Charlottesville Bypass

The requested files should be organized and readily available from the person or entity that undertook the traffic analysis.

By not disclosing these documents, MDOT is preventing the public from meaningfully reviewing and commenting on the traffic analysis in the FEIS. **We request that MDOT immediately provide the requested traffic spreadsheets and model files underlying its decisions in the FEIS, no later than July 7, 2022.** Because the Agencies have unlawfully hindered a proper review by not disclosing this in the first place, and as we have requested several times in the past, we request that the FEIS comment period be extended, consistent with letters submitted to the U.S. Department of Transportation, FHWA and MDOT, so that the public has a reasonable opportunity to review and comment on the FEIS's traffic analysis and conclusions.

Christina C. McClintock
Jill Grant & Associates, LLC
1319 F Street NW, Suite 300
Washington, DC 20004
202-821-1951
cmcclintock@jillgrantlaw.com

cc: Gregory Murrill, FHWA
Jitesh Parikh, FHWA
Jeanette Mar, FHWA
Josh Tulkin, Sierra Club Maryland Chapter
Norm Marshall, Smart Mobility Inc.

Christina McClintock

From: Timothy Perry <tperry1@mdot.maryland.gov>
Sent: Friday, July 1, 2022 12:26 PM
To: Christina McClintock
Subject: PIA 839412

Dear Ms. McClintock:

MDOT received your email dated June 29, 2022, which states the following:

> "I am writing to request documents cited in the FEIS. As explained in the attached request, this information is needed to meaningfully comment on the FEIS. Because of the upcoming deadline to review the FEIS and submit comments, we request this information by Thursday, July 7. "

Given your tight time frame, we wanted to make you aware of the following information. As this is a request for records, this falls under the Maryland Public Information Act (PIA) and is being handled accordingly. We are in the initial stages of this request and are preparing the legally required 10-day letter which is due July 14, 2022. We are advising you that we do not anticipate providing these records to you within the first 10 business days. As potential records will need to be retrieved, reviewed, and potentially redacted in accordance with all State and federal laws and regulations. Keep in mind, if it is determined there is a cost associated with your request, the 10-day letter will include the estimate cost and instructions on where to send payment. In the meantime, MDOT SHA has publicly available documents that may assist you with your research. Those documents can be found at: https://oplanesmd.com/

If have any questions about this PIA request, please feel free to contact me.

Sincerely,

Tim Perry

Timothy R. Perry

PIA Manager

Office of Policy and Regulations

Maryland Department of Transportation

7201 Corporate Center Drive

Hanover, MD 21076

O 410-865-1237

tperry1@mdot.maryland.gov

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July 14, 2022

Ms. Christina McClintock
Sierra Club, Maryland Chapter
1319 F Street NW, Suite 300
Washington DC 20004

Dear Ms. McClintock:

The Maryland Department of Transportation State Highway Administration (MDOT SHA) is in receipt of your request (839412) pursuant to the Maryland Public Information Act, General Provisions Article (GP), § 4-101 *et seq.,* Annotated Code of Maryland. Specifically, you requested:

> "We request that MDOT provide the requested traffic spreadsheets and model files underlying its conclusions in the FEIS, no later than July 7, 2022. To do a full review of the traffic modeling in the FEIS, including understanding changes between the FEIS modeling and the SDEIS modeling, we require the following traffic modeling files and documentation:
>
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As stated in our email dated July 1, 2022, given your tight time frame, we notified you of the following information: As this is a request for records, this falls under the Maryland Public Information Act (PIA) and is being handled accordingly. We did not anticipate providing these records to you within the first 10 business days. Potential records will need to be retrieved, reviewed, and potentially redacted in accordance with all State and federal laws and regulations. If it is determined there is a cost associated with your request, the 10-day letter will include the estimate cost and instructions on where to send payment.

Additionally, the MDOT SHA provided you with publicly available documents that may assist you with your research. Those documents can be found at: https://oplanesmd.com/

On July 8, 2022, and July 12, 2022, we discussed narrowing the scope of your request to reduce costs and staff time. You stated you would contact your client in an attempt to narrow the scope of the request. To date, we have not received a narrowed scope of the request from you.

GP § 4-206 authorizes MDOT to charge for time incurred to prepare, search, and review documents after the first two hours of work. We estimate that this request would require approximately 238 staff hours with an estimated cost of $21,795.81. This estimate includes preliminary email searches for numbers 5, 10, 11, and 13 of your request that yielded approximately 2,739 potentially responsive emails. As discussed, we are happy to work with you to further narrow the scope of your request in an effort to reduce the cost. As you can imagine, this is a massive request that, as currently stated, may be cost prohibitive and may not provide you with the records you are ultimately seeking. If you identify and authorize a more targeted search, we would be happy to provide you with a revised fee estimate. Should you wish to continue with the current requested scope, please forward a check made payable to the Maryland Department of Transportation to:

Ms. Jean Anne Hosker
PIA Representative
MDOT State Highway Administration
707 North Calvert Street
Baltimore MD 21202-3601

Please be advised that we will not begin working on your request until and unless we receive payment. If, after we have completed the work, the actual cost differs from this estimate, you will either be required to pay the balance prior to receiving the records or you will be issued a refund. If we do not receive payment from you by July 29, 2022, we will consider the matter closed. Of course, you may reinitiate a new request at any time.

Payment does not guarantee the full release of the records you seek. It is possible that records or information within the records requested may be redacted or exempt from disclosure under State and/or federal laws and/or regulations.

We have considered your organization's request for a waiver of fees. The Maryland Department of Transportation (MDOT) PIA policy provides a waiver process whereby each request is considered on a request-by-request basis, which we have done in this case. We are committed to transparency and will provide records in accordance with all laws and regulations. We also have a State fiduciary constitutional responsibility to the citizens of Maryland to recover the public dollars expended to fulfill these requests. While fees recovered can never fully reimburse the State for all the costs involved in researching and processing a PIA request, MDOT policy seeks to recover as many costs as permissible to ensure the integrity of the Transportation Trust Fund. We have carefully considered your request for a fee waiver in the public interest and your status as a noncommercial nonprofit organization. The PIA statute does not provide for waived fees due to a nonprofit status. MDOT SHA is ready to provide the responsive documents to your request, but MDOT SHA will not waive the associated fees for this request.

Pursuant to GP § 4-362, your client is entitled to seek judicial review of this decision. Alternatively, your client may file a request for mediation with the Public Access Ombudsman and, if the Ombudsman is unable to resolve the matter, may subsequently seek a resolution from the Public Information Act Compliance Board for those matters within the Compliance Board's jurisdiction. See GP §§ 4-1A-01 *et seq.* and 4-1B-01 *et seq.*

For efficiency reasons and to keep operational costs as low as possible, we encourage all requesters to submit their PIA requests through the MDOT online form, which can be found at www.mdot.maryland.gov. Click on the About tab at the top and then Public Information Act. You will find all PIA Representative contact information and other helpful information.

If you have any questions, you may contact me at 410-545-0429 or jhosker@mdot.maryland.gov. I will be happy to assist you.

Sincerely,

Jean Anne Hosker

Jean Anne Hosker
MDOT SHA PIA Representative

Resume

NORMAN L. MARSHALL, PRESIDENT

nmarshall@smartmobility.com

EDUCATION:

Master of Science in Engineering Sciences, Dartmouth College, Hanover, NH, 1982
Bachelor of Science in Mathematics, Worcester Polytechnic Institute, Worcester, MA, 1977

PROFESSIONAL EXPERIENCE: (34 Years, 20 at Smart Mobility, Inc.)

Norm Marshall helped found Smart Mobility, Inc. in 2001. Prior to this, he was at RSG for 14 years where he developed a national practice in travel demand modeling. He specializes in analyzing the relationships between the built environment and travel behavior, and doing planning that coordinates multi-modal transportation with land use and community needs.

Regional Land Use/Transportation Scenario Planning

Portland Area Comprehensive Transportation System (PACTS) – the Portland Maine Metropolitan Planning Organization. Updating regional travel demand model with new data (including AirSage), adding a truck model, and multiclass Dynamic Traffic Assignment (DTA) including differentiation between cash toll and transponder payments.

Loudoun County Virginia Dynamic Traffic Assignment – Enhanced subarea travel demand model to include Dynamic Traffic Assignment (Cube). Model being used to better understand impacts of roadway expansion on induced travel.

Vermont Agency of Transportation-Enhanced statewide travel demand model to evaluate travel impacts of closures and delays resulting from severe storm events. Model uses innovate Monte Carlo simulations process to account for combinations of failures.

California Air Resources Board – Led team including the University of California in $250k project that reviewed the ability of the new generation of regional activity-based models and land use models to accurately account for greenhouse gas emissions from alternative scenarios including more compact walkable land use and roadway pricing. This work included hands-on testing of the most complex travel demand models in use in the U.S. today.

Climate Plan (California statewide) – Assisted large coalition of groups in reviewing and participating in the target setting process required by Senate Bill 375 and administered by the California Air Resources Board to reduce future greenhouse gas emissions through land use measures and other regional initiatives.

Chittenden County (2060 Land use and Transportation Vision Burlington Vermont region) – led extensive public visioning project as part of MPO's long-range transportation plan update.

Flagstaff Metropolitan Planning Organization – Implemented walk, transit and bike models within regional travel demand model. The bike model includes skimming bike networks including on-road and off-road bicycle facilities with a bike level of service established for each segment.

Chicago Metropolis Plan and Chicago Metropolis Freight Plan (6-county region)— developed alternative transportation scenarios, made enhancements in the regional travel demand model, and used the enhanced model to evaluate alternative scenarios including development of alternative regional transit concepts. Developed multi-class assignment model and used it to analyze freight alternatives including congestion pricing and other peak shifting strategies.

Municipal Planning

City of Grand Rapids – Michigan Street Corridor – developed peak period subarea model including non-motorized trips based on urban form. Model is being used to develop traffic volumes for several alternatives that are being additional analyzed using the City's Synchro model

City of Omaha - Modified regional travel demand model to properly account for non-motorized trips, transit trips and shorter auto trips that would result from more compact mixed-use development. Scenarios with different roadway, transit, and land use alternatives were modeled.

City of Dublin (Columbus region) – Modified regional travel demand model to properly account for non-motorized trips and shorter auto trips that would result from more compact mixed-use development. The model was applied in analyses for a new downtown to be constructed in the Bridge Street corridor on both sides of an historic village center.

City of Portland, Maine – Implemented model improvements that better account for non-motorized trips and interactions between land use and transportation, and applied the enhanced model to two subarea studies.

City of Honolulu – Kaka'ako Transit Oriented Development (TOD) – applied regional travel demand model in estimating impacts of proposed TOD including estimating internal trip capture.

City of Burlington (Vermont) Transportation Plan – Led team that developing Transportation Plan focused on supporting increased population and employment without increases in traffic by focusing investments and policies on transit, walking, biking and Transportation Demand Management.

Transit Planning

Regional Transportation Authority (Chicago) and Chicago Metropolis 2020 – evaluated alternative 2020 and 2030 system-wide transit scenarios including deterioration and enhance/expand under alternative land use and energy pricing assumptions in support of initiatives for increased public funding.

Capital Metropolitan Transportation Authority (Austin, TX) Transit Vision – analyzed the regional effects of implementing the transit vision in concert with an aggressive transit-oriented development plan developed by Calthorpe Associates. Transit vision includes commuter rail and BRT.

Bus Rapid Transit for Northern Virginia HOT Lanes (Breakthrough Technologies, Inc and Environmental Defense.) – analyzed alternative Bus Rapid Transit (BRT) strategies for proposed privately-developing High Occupancy Toll lanes on I-95 and I-495 (Capital Beltway) including different service alternatives (point-to-point services, trunk lines intersecting connecting routes at in-line stations, and hybrid).

Roadway Corridor Planning

I-10 El Paso – In work for El Paso County, reviewed proposed I-10 expansion in downtown El Paso and developed and modeled conceptual alternatives that involved less widening.

I-30 Little Rock Arkansas – Developed enhanced version of regional travel demand model that integrates TransCAD with open source Dynamic Traffic Assignment (DTA) software, and used to model I-30 alternatives. This model models freeway bottlenecks much more accurately than the base TransCAD model.

South Evacuation Lifeline (SELL) – In work for the South Carolina Coastal Conservation League, used Dynamic Travel Assignment (DTA) to estimate evaluation times with different transportation alternatives in coastal South Caroline including a new proposed freeway.

Hudson River Crossing Study (Capital District Transportation Committee and NYSDOT) – Analyzing long term capacity needs for Hudson River bridges which a special focus on the I-90 Patroon Island Bridge where a microsimulation VISSIM model was developed and applied.

PUBLICATIONS AND PRESENTATIONS (partial list)

DTA Love: Co-leader of workshop on Dynamic Traffic Assignment at the June 2019 Transportation Research Board Planning Applications Conference.

Forecasting the Impossible: The Status Quo of Estimating Traffic Flows with Static Traffic Assignment and the Future of Dynamic Traffic Assignment. *Research in Transportation Business and Management* 2018.

Assessing Freeway Expansion Projects with Regional Dynamic Traffic Assignment. Presented at the August 2018 Transportation Research Board Tools of the Trade Conference on Transportation Planning for Small and Medium Sized Communities.

Vermont Statewide Resilience Modeling. With Joseph Segale, James Sullivan and Roy Schiff. Presented at the May 2017 Transportation Research Board Planning Applications Conference.

Assessing Freeway Expansion Projects with Regional Dynamic Traffic Assignment. Presented at the May 2017 Transportation Research Board Planning Applications Conference.

Pre-Destination Choice Walk Mode Choice Modeling. Presented at the May 2017 Transportation Research Board Planning Applications Conference.

A Statistical Model of Regional Traffic Congestion in the United States, presented at the 2016 Annual Meeting of the Transportation Research Board.

MEMBERSHIPS/AFFILIATIONS

Associate Member, Transportation Research Board (TRB)

Member and Co-Leader Project for Transportation Modeling Reform, Congress for the New Urbanism (CNU)