



## TPB TRAVEL FORECASTING SUBCOMMITTEE

### HIGHLIGHTS OF THE SEPTEMBER 24, 2021 MEETING

9:30 A.M. to 12:00 noon, **Web conferencing ONLY, due to COVID-19 precautions. There was no on-site meeting.**

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### MEETING ATTENDEES

#### MEMBERS, ALTERNATES, AND PARTICIPANTS

- Arun Akkinepally (Caliper)
- Jonathan Avner (Whitman, Requardt & Assoc.)
- Rama Balakrishna (Caliper)
- Keith Belcher (MDOT-SHA - TFAD)
- Vince Bernardin (Caliper)
- Katie Brinson (Bentley Systems)
- Jim Bunch (Sabra & Associates)
- Kevin Chai (Fairfax Co. DOT)
- Tom Creasey (Caliper)
- Michael Eichler (WMATA)
- Joel Freedman (RSG Inc)
- Dan Goldfarb (NVTC)
- Eric Graye (M-NCPPC, Montgomery Co.)
- Adam King (Caliper)
- Jim Lam (Caliper)
- Jaesup Lee (M-NCPPC, Montgomery Co.)
- Li Li (Whitman, Requardt & Assoc.)
- Yuanjun Li (M-NCPPC, Montgomery Co.)
- Feng Liu (Cambridge Systematics)
- Dan Morgan (Caliper)
- Vahid Moshtagh (VDOT)
- Srikanth Neelisetty (Transurban)
- Krishna Patnam (AECOM)
- Marie Pham (Loudoun Co.)
- Andres Rabinowicz (Caliper)
- Mark Radovic (Gannet Fleming)
- Harun Rashid (NVTA)
- Paul Ricotta (Caliper)
- Elham Shayanfar (MDOT)
- Howard Slavin (Caliper)
- Jiaxin Tong (Kimley-Horn & Assoc.)
- Kyle Ward (Caliper)
- Malcolm Watson (Fairfax County DOT)
- Jongsun Won (PTV Group)
- Allan Yu (Prince William Co.)
- Yi Zhao (DDOT)

#### COG STAFF

- William Bacon
- Tim Canan
- Nazneen Ferdous
- Ken Joh
- Martha Kile
- Sanghyeon Ko
- Arianna Koudounas
- James Li
- Mark Moran
- Ray Ngo
- Jinchul (JC) Park
- Meseret Seifu
- Dusan Vuksan
- Feng Xie
- Jim Yin

This meeting of the Travel Forecasting Subcommittee (TFS) was chaired by Mr. Eichler.

## **1. INTRODUCTIONS AND APPROVAL OF MEETING HIGHLIGHTS FROM THE PREVIOUS MEETING**

First, a roll call was conducted. Next, the highlights of the July 16, 2021 meeting of the TFS were approved without changes.

## **2. COG/TPB AIR PASSENGER SURVEYS: EVALUATION OF METHODOLOGY**

This item was presented by Dr. Joh, who spoke from a set of presentation slides. He stated that COG/TPB conducts a regional air passenger survey (APS), every two years, at the Washington-Baltimore region's three commercial airports: Baltimore/Washington International Thurgood Marshall Airport (BWI), Ronald Reagan Washington National Airport (DCA) and Dulles International Airport (IAD). The last APS was conducted in 2019 and was a paper-based intercept survey conducted at boarding gates using a stratified sampling approach. However, TPB staff observed a decline in the overall response rate and the quality of survey responses. ICF was contracted to conduct a comprehensive evaluation of the APS Response Rate Study. ICF provided 25 actionable recommendations for the TPB to consider in future APS's. Dr. Joh indicated that TPB staff evaluated and selected the following five recommendations that would be feasible for implementation in the next APS:

1. Conduct a pre-test before full-scale data collection;
2. Transition to electronic data collection, a web survey that can be taken on a tablet or a mobile device;
3. Offer incentives to participants, in the form of a raffle or drawing;
4. Reduce item nonresponse by including stronger language for privacy and confidentiality in the survey and drop sensitive trip origin questions; and
5. Include airport employees in the survey.

Dr. Joh described in detail the benefits, costs, and other considerations to implement these changes.

Following the presentation, the following questions were asked. Mr. Moran asked if there are other urban areas that conduct air passenger surveys as frequently as the Washington metropolitan region? Dr. Joh responded that the DC region conducts surveys more frequently compared to other regions although there are other airports that have started to conduct surveys on a rolling basis, as opposed to cross-sectional surveys.

Regarding slide 21, which contained a staff recommendation to drop the origin street address question from the survey and collect trip origin information at the ZIP Code level, Mr. Moran asked whether other airport surveys have done this and whether the contractor for the Gen3 Model has any comments on this recommendation. Dr. Joh responded that most other airport surveys asked for the detailed origin address. However, there were a few surveys which did not ask for the exact street address, such as the airport survey conducted at the Los Angeles Airport (LAX), which asked for the

respondent's Zip Code, followed by county and neighborhood/area. This may be an alternate approach to collect detailed origin address information.

Mr. Moran also commented that including airport employees in the survey is an interesting idea and he agrees with the recommendation.

Mr. Canan commented that staff is mindful about the need for geographic precision for regional travel demand modeling purposes, and that the purpose of the study was to improve the survey methodology to reverse the trend of declining response rates. He noted that some Aviation Technical Subcommittee members commented that while asking for the Zip Code may be helpful, visitors to the region may not know the ZIP Code of their hotel. Therefore, more thought will be given on this recommendation and staff plans to consult with COG's Travel Forecasting and Emissions Analysis Team and the Gen3 Model team to determine the best path forward to obtain this information.

Mr. Freedman commented, via the chat window, that asking for the origin address may be a mixed bag since residents are concerned about security and visitors may not know their hotel address. Dr. Joh stated that is a valid point. Mr. Freedman also added that only about half of respondents provide an accurate address while other respondents provide a location proximate to the actual origin.

### **3. INTEGRATING ACTIVITYSIM AND DYNAMIC TRAFFIC ASSIGNMENT FOR A MEDIUM-SIZED CITY IN OHIO**

This item was presented by Mr. Slavin, Mr. Bernardin, Mr. Morgan, Mr. Rabinowicz, and Mr. Akkinepally, who spoke from a set of presentation slides. Mr. Slavin introduced the ongoing effort and goals of the Toledo Metropolitan Area Council of Governments (TMACOG) to implement a combined ActivitySim model and a TransModeler mesoscopic Dynamic Traffic Assignment (DTA). He noted the desire to provide better support for activity-based models (ABMs) in general and for ActivitySim users in particular. Mr. Slavin stated that the goal is to advance ABM-DTA integration to the next level and to fulfill a longstanding FHWA and Ohio Department of Transportation (ODOT) desire to have a working and realistic ABM-DTA model example that runs fast enough to help explain concepts and explore issues. He reviewed prior R&D projects to advance ABMs, DTA, and their integration.

Mr. Bernardin introduced the motivation for the Toledo study area including its easily manageable size as well as a previous TransModeler model and interest in planning for operations.

Mr. Akkinepally presented the basics of initial ActivitySim implementation issues, lessons learned, and initial results. He stated that the implementation started from the Southeast Michigan Council of Governments (SEMCOG; Detroit, Michigan) version of ActivitySim and was modified for the Toledo study area and project. He noted that TransCAD's native population synthesis, a fast, Iterative Proportional Updating (IPU) algorithm supporting household and person controls at multiple levels of geography and subarea resynthesis, had been substituted for PopulationSim. He added that the transit modes were simplified to represent the limited transit modes in Toledo. Mr. Akkinepally discussed the challenges of wrapping ActivitySim in TransCAD, particularly the ways in which run configurations and model specifications are split across multiple files and how relatively straightforward changes (such as modes) required trial and error due to limited documentation. He presented some preliminary results from the model to illustrate that the model is running and producing generally reasonable results and noted that considerable calibration is still needed.

Mr. Bernardin discussed the TransCAD interface for the model and its benefits. The interface attempts to organize and expose the parameters for easy user reference and editing. It also has built-in file/scenario management to make it easy for end users to create branch scenarios without overwriting the base. The flowchart also allows execution of the pipeline from any stage/component of the model and includes TransCAD's native support for visualization and reporting of results through dashboards. Mr. Akkinepally demonstrated these features using the TransCAD interface.

Mr. Morgan described the general motivations for using DTA, which include the ability to realistically capture the variation of travel times over short intervals, queuing/spillback, and the influence of travel time variability and queuing on route choice. He indicated that route choice could be sensitive to individual characteristics and behaviors. DTA simulation can and should preserve the order of trips and tours and support animation for analysis and stakeholder engagement. In the context of a combined ABM-DTA model like Toledo's, Mr. Morgan shared examples of information loss in the skims by comparing skims at the period versus half-hour level and illustrated TransModeler's ability to trace multi-stop tours. He explained how DTA works at a very high level, iterating between network loading, costs evaluation, and route choices and the various resolutions at which DTA can be implemented. He noted that the Toledo implementation is TransModeler's mesoscopic model, which is a balance between level of detail and operational detail on the one hand and runtime and input data requirements on the other. Mr. Morgan concluded his presentation with a demo of the Toledo TransModeler model.

Mr. Slavin concluded the presentation with a brief review, noting the successful implementation of ActivitySim, full integration with TransCAD's flowchart GUI and TransModeler's mesoscopic DTA, with its realistic traffic dynamics and visualizations, and reasonably fast system runtimes.

Due to time constraints, questions were asked and answered, via the chat window.

Mr. Patnam asked what "OSM" trip-based model stand for? Mr. Bernardin replied "OSM" is an abbreviation for Ohio Small and Medium Metro Standard Model. Toledo is the largest of the eight Ohio MPOs that use OSM standard model. He also asked what are the R&D plans of Caliper regarding the open-source ActivitySim? Whether there is a plan to re-code ActivitySim to be native to TransCAD/TransModeler in the future?

Mr. Patnam asked whether the DTA change departure/arrival times are based on congestion and dependencies. Mr. Morgan responded no, the DTA is not changing the departure times. There is reliance on feedback with the ABM to change departure times. Arrival times are an output of the simulation and can be fed back to the ABM so that it knows which trips and tours were and were not feasible.

Mr. Patnam also asked what is the fidelity used for modeling transit-trips in this mesoscale? Mr. Morgan replied that transit trips are generated based on route headways or a specific schedule. In the meso model, there is less detail in the simulation of the bus and train movements. They do not stop to serve stops, for example. That is exclusive to the micro model.

Mr. Freedman asked, which donor ActivitySim model was used? Is there a specific version and release date targeted for the ActivitySim functionality shown? Mr. Bernardin replied that SEMCOG was the donor ActivitySim model. The functionality will be made available to any MPOs that want TransCAD-based ActivitySim.

Mr. Bunch asked would it be possible to run the traditional zone-based, equilibrium-based assignment for comparison purposes within this interface? What are the differences by time period?

Mr. Morgan responded, yes, the user could swap the TransModeler DTA step in the interface with a traditional static assignment. As some of the charts in the presentation indicated, it is noted that, in some cases where one samples two origin-destination pairs, there are some cases where the static

skims underestimated the time relative to the DTA and some cases where the skims overestimated the time.

Mr. Xie asked, is the user allowed to customize the dashboard or has Caliper already designed it? In which programming language is the dashboard built? Mr. Rabinowicz replied that TransCAD will have a dashboard designer utility that will let users customize the provided dashboards or create new ones. Mr. Xie also asked what are the typical data requirements for developing (calibration, validation, etc.) a regional DTA? Mr. Morgan responded the typical data requirements for regional DTA calibration and validation are not very different from a static model. However, the calibration and validation data (counts, speeds, and travel times) are needed at smaller intervals. He indicated that they typically calibrate and validate to 15-minute data. The models are also improved with better signal timing information, even though there are ways to estimate signal timings where they cannot be obtained. He stated that identifying signalized intersections when coding the network geometry is another requirement and is a much less expensive way.

Mr. Neelisetty asked how are dynamically priced toll roads simulated? Is there functionality to increase/decrease toll prices to meet a level of service input, for example, 50 mph minimum speed? Mr. Morgan responded that dynamically priced roads are simulated by providing the tolling strategy as inputs. Those can be fixed based on a schedule or can be traffic-responsive, changing when sensors in the model measure speeds or occupancies that hit certain thresholds. The price can also vary by zone or trip destination. Alternatively, the API to implement a specific pricing algorithm, which several Express Lane operators and concessionaires have done for their facilities, can be used. In addition, dynamic message signs can be placed in the network. The model simulates drivers passing the message signs and updating their route choices based on the current price, which may be different from the price assumed when the pre-trip route choice was made. Over DTA iterations, as experienced travel times and delays evolve in the model, expected travel time savings converge, and drivers make better, more consistent decisions about whether to pay or use the general purpose facility based on value of time (VOT).

Mr. Rashid asked how long it takes to have a reasonable convergence for the Toledo DTA? Mr. Morgan responded regarding the convergence between feedback iterations, in the Jacksonville implementation with DaySim, Caliper and RSG did delve into the mechanics of the feedback to confirm that trip schedules were appropriately adjusted to account for the DTA skims. The first iteration, which schedules tours based on static skims, tended to underestimate congested times. After the first feedback loop with the DTA, there is the biggest movement in the subsequent tour schedules and much smaller changes in skims between the subsequent feedback iterations. He added that he does not recall whether the change in percent was quantified. He indicated the availability of a report placed on the web that provides more details.<sup>1</sup>

Mr. Rashid also asked if there were any issues faced developing these models? Mr. Morgan responded that, many issues are always faced when developing these models. Recurrent issues are those having to do with centroid connectivity and level of network detail. Developing a robust DTA almost always requires addition of network detail relative to what is found in the trip-based model, which requires an examination of centroid connectivity and how trips are distributed to loading points in a zone. However, there are tools for dealing with that.

Mr. Moshtagh asked what is the commonly achieved traffic assignment relative gap during the peak hour (not averaged over 24 hours)? Mr. Morgan responded that relative gaps vary considerably depending on the model. As has been reported widely in the research, modelers can get to relative

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<sup>1</sup> RSG et al., "Volume 2: Model Impacts of Connected and Autonomous/Automated Vehicles (CAVs) and Ride-Hailing with an Activity-Based Model (ABM) and Dynamic Traffic Assignment (DTA) – An Experiment" (Washington, D.C.: U.S. Department of Transportation, Federal Highway Administration, April 2018), <https://www.caliper.com/press/model-impacts-of-cavs-with-abm-and-dta.pdf>.

gaps of 1-2% in congested models. Models that are not very congested, like Toledo, can achieve much lower gaps, often lower than 1%. A gap is computed for each departure interval and averaged over the entire period. At convergence, more congested intervals will have higher gaps than less congested ones, partly owing to the stochastic nature of simulation/DTA. Variance in level of service measures increases as congestion increases, but it is still possible to ensure that route choices and performance measures are stable and consistent at convergence.

Mr. Moshtagh also asked what is a better way to test a network refinement scenario (e.g. adding an auxiliary lane to a freeway), starting from an unloaded network or from a previously achieved equilibrium? He added, in the latter case, which is faster, the concern would be VMT and VHT would improve not only because of the added auxiliary lane, but also allowing more iterations will result in getting closer to real equilibrium. Mr. Morgan replied that, it is advised to warm start a DTA with modest geometric improvements with the travel costs of a previously run DTA. This allows for faster convergence (i.e., in fewer iterations) as compared to a cold-start DTA. In other words, one would generally start from a previously achieved equilibrium unless the changes to the network are substantial. It is possible to study the sensitivity of VMT and VHT to the number of iterations and warm vs. cold start. He noted that the question is an interesting one which is currently being studied for the Michigan DOT (MichDOT). Mr. Moshtagh asked how close the results would be if one were to run a model again, thus how good is the reproducibility of ABM/DTA or DTA models? Mr. Morgan replied how close the results would be between different runs (with different random seeds) likely varies widely between models and with severity of congestion. The study that is being conducted for MichDOT (mentioned above) will determine this for a meso model of the Detroit region. He noted that reproducibility of ABM/DTA is an important, open question that Caliper is currently exploring.

#### **4. REWEIGHTING OF THE 2017-2018 COG/TPB REGIONAL TRAVEL SURVEY (RTS)/2018-2019 MARYLAND TRAVEL SURVEY (MTS) DATA FOR DEVELOPMENT OF THE GEN3 TRAVEL MODEL, PHASE 1**

The item was presented by Mr. Ngo, who spoke from a set of presentation slides. Mr. Ngo discussed the discrepancies of the merged 2017/2018 Regional Travel Survey and 2018/2019 Maryland Travel Survey variables of interest for the Gen3 Model. The discrepancies include the underestimation of households with low or very low income (<\$50K), the underestimation of households with zero vehicles in suburban areas, the overestimation of homeschooled students, the overestimation of commuter rail ridership, and the underestimation of bus ridership. To address these issues, per RSG's recommendation and guidance, TPB staff reweighted the survey using PopulationSim, by including 21 household-level and 36 person-level variables as controls and 7 sets of PUMA consolidation. Mr. Ngo illustrated the improvements on various variables after implementing the reweighting process. He concluded that the reweighting process was satisfactory and noted that the resulting weights from this post-process have been used for the Gen3, Phase 1 Model development.

#### **5. COG/TPB GEN3 TRAVEL MODEL: STATUS REPORT**

This item was presented by Joel Freedman who spoke from a set of presentation slides. Mr. Freedman described work performed by RSG over the past two months to estimate components of the MWCOG Gen3 Model. The components estimated include tour mode and destination choice models. The Gen3 team estimated tour mode choice models using the "estimation mode" functionality of ActivitySim and used ALOGIT to estimate destination choice models. Mr. Freedman described the estimation-mode functionality of the software and the process used to prepare the household travel survey and create the "estimation data bundles" used for model estimation. Mr. Freedman showed the format of the Jupyter Notebooks used to estimate tour mode models and export data for ALOGIT. Finally, he described the estimation data and estimation results for selected models and tour purposes.

## **6. ROUNDTABLE DISCUSSION OF CURRENT MODELING EFFORTS AROUND THE REGION**

Due to time constraints, this item was postponed for a later meeting date.

## **7. OTHER BUSINESS**

### **A. Snapshots of effects of COVID-19 on travel, available on COG website**

Martha Kile reported that COG/TPB staff has developed the sixth in a series of snapshots to illustrate how the COVID-19 pandemic is impacting travel in the metropolitan Washington. The charts show changes in roadway traffic and enplanements as compared with pre-pandemic levels. The intention is to update this report on a regular basis as data become available. The snapshot is available on the COG website using this link

<https://www.mwcog.org/documents/2021/07/16/covid-19-travel-monitoring-snapshot-traffic-monitoring/>. The current snapshot shows traffic data through July 2021. Ms. Kile noted that roadway traffic and enplanements experienced a notable rebound over the summer with July 2021 roadway traffic levels down only 5 percent from July 2019 levels region-wide and noted that enplanements at DCA and IAD had grown to 70 percent of July 2019 levels.

### **B. Big Data Evaluation Update**

Mr. Canan informed the subcommittee that the final report for the consultant-led independent evaluation of Big Data products and their applicability to TPB's program requirements will be posted to the COG website shortly. Once posted, interested parties can download the final report and accompanying appendices. To find the report, users should enter the keywords "Big Data" on COG's homepage.

### **C. Upcoming guest presentations at TFS meetings in 2021**

Mr. Moran discussed the planned guest presentation topics at upcoming TFS meetings:

- November 19: There has been a cancellation so there is currently no planned guest presentation for the Nov. TFS meeting. Mark invited anyone who is interested in making a presentation to the TFS to contact him by email. [Editor's note: The currently planned guest presentation for the Nov. TFS meeting is "Transitioning from a trip-based travel model to an activity-based travel model: Experiences of the Atlanta Regional Commission," Guy Rousseau]
- Jan. 28.: Modeling public transport in the Arlington Co. Travel Model, by Arlington Co. and/or Bentley Systems, Inc.

## **8. ADJOURN**

The meeting adjourned at 11:55 A.M. The next meeting is scheduled for Friday, November 19, 2021 at 9:30 A.M.