

## **Highlights of the TPB Travel Forecasting Subcommittee Meeting Held on July 23, 2004**

Bill Mann of Virginia Department of Transportation chaired this meeting.

### **Item 1: Approval of May 21, 2004 Meeting Highlights**

The highlights were approved as written.

### **Item 2: Commercial Vehicle and Truck Model Development for COG/TPB**

Bill Allen distributed a hard copy of his presentation slides entitled “Truck and Commercial Vehicle Model.” He began his presentation with a brief overview of the historical background of truck modeling at COG dating back to 1968. He stated that the need to develop new truck models is largely based on the following:

- Revision is overdue
- Responds to TRB Committee comments
- Truck VMT is important for air quality
- Greater emphasis on goods movement
- Need to include Commercial trips

Mr. Allen stated that truck surveys are very expensive, logistically difficult, and usually result in a low sample size. He added that successful truck surveys are very rare and is very common to have unusable data. Therefore, a new approach or alternative procedure was developed. This approach has been used at the Baltimore Metropolitan Council (BMC) and Ohio Department of Transportation (ODOT). Currently, the source of the starting model tends to be the Phoenix Metropolitan Area, where a successful truck survey was done several years ago, and that model was considered by TMIP as being a good representative model of truck trips. Classification (medium and heavy truck) count data can be used to synthesize a trip table. He indicated that this is a robust approach and can be used to refine the starting model.

He provided the definitions of:

- Heavy Truck: 3+ axles, more than 6 tires
- Medium Truck: 2 axle, 6 tires, and
- Commercial: light duty vehicles used for business

Mr. Allen gave examples of “commercial” vehicles: FedEx/UPS, postal vehicles, taxis, plumbers, carpenters, couriers, government vehicles, service technicians, meter readers, landscapers, and light duty delivery and construction trucks. Currently, the TPB travel model includes these trips in the non-home-based (NHB) trip purpose. He explained since validation of the model is done to total counts and since there is no commercial vehicle component in the current truck model, including commercial vehicles in NHB trips or in the truck model affects mode choice and air quality emissions estimation, respectively.

The calibration procedure proposed for the commercial vehicle model is the same as he proposed for the truck model:

- adapt a starting model from another area;

- synthesize commercial counts;
- use counts to get an “observed” trip table; and
- work backwards to revise the starting model.

Mr. Allen explained that the new count program proposed includes:

- new manual counts – vehicles with text or logo, or carrying equipment
- counting commercial and total vehicles separately
- the counting will be done at 170+ locations; 4-6 hours at midday
- stratified by facility type and across the region
- COG staff will conduct the survey over the next several months.

He indicated that this count data will be used as a database to synthesize the commercial model. The model will be a simple logit (as used for BMC) or a more sophisticated look-up table (as used for ODOT) based on link attributes.

Mr. Allen indicated that the commercial vehicle model will be done the same way as the truck model, i.e., borrow a starting model. A simple linear regression model would be used, based on employment by type (industrial, office, retail) and households, similar to the commercial model developed for Lehigh Valley, PA. The model would account for “truck zones” and area type. He stated that truck zones are TAZs of high truck/commercial activity- higher than average trips/employee, both for trucks and commercial. These areas include downtown areas, package delivery areas, truck terminals, major warehousing, and airports.

Mr. Allen has developed a process called “Adaptable Assignment.” The process uses a series of TP+ procedures to create a trip table that matches count data better. He discussed briefly the BMC validation results, demonstrating that the new truck models lowered the link volume RMSE.

In conclusion, Mr. Allen indicated that the final truck and commercial vehicle models should include a generation model, distribution model, external model, through trip process, time-of-day split, and specialized assignment procedures. TP+ setups will be included. The commercial model will fill an important gap (e.g. in Baltimore having medium truck, heavy truck, and commercial vehicle models made a noticeable difference in the overall RMSE, decreasing by about 5 percent). He indicated that the only way is a very creative use of count data and careful clean-up of the database.

He briefed the subcommittee on the work schedule:

- Currently assembling truck count data (MDOT and VDOT have classification count data)
- Fall: extensive quality checks, possible new truck counts
- Fall: do commercial counts (on 170+ locations)
- Winter: model development (medium, heavy, and commercial truck models)

### Questions and Comments

Dick Pratt asked why an 18-hour commercial vehicle count was not considered instead of the proposed 4-6 hrs count. Mr. Allen responded that the longer the count is, the more representative the count becomes, i.e., to capture the actual conditions during peak, off-peak, and night times. However, the problem with commercial vehicle counts is that the count can only be done manually (by a person standing on a street). Rotating the surveyors would be one option, and this

will be discussed with COG staff to find out whether it is a possibility. He added that, according to an article in ITE journal published a couple of years ago on the same topic, there was a question regarding “how many hours should trucks be counted out of the day to obtain a representative 24 hr truck proportion”. The article came to the same conclusion that the more hours the count is done the better, however, if the count is done as many as 6 hours, between 10AM and 4 PM, in terms of percent trucks, good data can be obtained. He added that the 18-hour count will be a function of the budget that COG staff have for this project. Jim Hogan added that staff has limited resources; 170+ locations plus 4-6 hours of count means a lot of manpower.

Gregg Stevenson asked is there a way to identify how many people are driving commercial vehicles to and from their houses vs. going to a work site and picking up a vehicle. Mr. Allen replied that this kind of trip should be reflected in the Home Interview Survey (HIS). Usually home to first work stop trips are not fully reflected in HIS and therefore need to be captured. It is not unusual to include some commercial vehicles that should not be included in the count and to miss some that should be included in the count.

Jun Villoria asked whether most of the truck traffic occurs during mid-day. Mr. Allen replied that much truck traffic actually occurs during the off-peak period, early morning or late night. The 6-hour count from 10:00 AM – 4:00 PM might do a better job in capturing medium trucks than heavy trucks. An external truck survey was undertaken for the region in spring and summer 2003 and will be used to develop external and through trips models. The last internal truck survey was conducted in 1996 and was not a usable data set for updating the truck models. A synthetic travel pattern derived from classification counts will be used to develop the internal truck model. However, external and through trips model development should be based on external truck surveys, for external and through trips are unique to any given urban area.

Mike Clifford asked whether the commercial vehicle models would include time-of-day, i.e., AM, PM, and off-peak. Mr. Allen responded the initial truck models (the generation and distribution models) would be total daily trips. The data collected for commercial vehicles would be percent commercial and would be assumed as daily percent. Initially, the medium, heavy trucks, and commercial vehicle models will be developed to represent 24 hours, and then time-of-day factors will be applied, as in the V2.1D travel model. Mr. Clifford asked whether the existing medium and heavy truck models would be updated. Mr. Allen replied that the medium and heavy truck models will be brand new models. The existing COG model or, as for BMC, the Phoenix model can be used as a starting model. Mr. Clifford asked, besides the commercial vehicles, will the classification counts include medium and heavy trucks? Mr. Allen responded that the primary count will be commercial vehicles, but the surveyors could be asked to count two more categories, medium trucks and heavy trucks.

Mr. Clifford stated that a couple of years ago COG made an assessment of trucks on local roads. The study approach was also designed for different parts of the region by facility type. He asked whether the same approach will be used for the 170+ locations or will the HPMS locations, which already have their own physical parameters associated with them, be used? Mr. Allen acknowledged the suggestion and will look more into it.

Eric Graye asked whether the approach used to develop trucks and commercial vehicle models for COG would be the same as the Baltimore models. Mr. Allen responded that it will be the same at first. However, one of the big differences between the two approaches is that the count data for COG’s truck models will be obtained from two different states (Virginia and Maryland). It requires a lot of effort to clean up the count data to make sure it is an apples-to-apples comparison. In the case of BMC the count data used was all MDOT data.

Kameel Holmes asked whether the commodity-flow model would be used to obtain trip productions and attractions. Mr. Allen responded that there are two types of truck models, commodity-flow and the trip model. The commodity-flow model is not yet ready; a lot of development and data collection need to occur to develop such a model. It is like modeling the entire US economy. It is a task that cannot be done by an MPO. The truck models that will be developed are standard trip production and trip attraction based models.

Ron Kirby asked whether truck zones would be developed for travel forecasting purposes. Mr. Allen replied that it will be included explicitly as a new variable in the truck models. Mr. Kirby asked how international freight, like airfreight, that affect truck movements could be addressed in the truck models. Mr. Allen replied that it is not an easy task to address this issue especially when there are a lot of issues that affect trucking. There is a need to conduct new surveys based on different policies and trends, and update the methodology that will be used to develop the truck models every 5 and 10 years.

### **Item 3: Update on the Multi-Year Work Program for Models Development**

Ron Kirby distributed a handout entitled “Review of Proposed Work Program to Address the Travel Demand Modeling Topics Identified in the Transportation Research Board (TRB) Review.” He stated this handout had been presented in the special TPB work session on Wednesday July 21, and under item #9 of the TPB meeting agenda. Three items were attached:

1. A short article reproduced from the TPB’s 2002 Annual Report describing the travel forecasting process;
2. A briefing paper outlining the six key topics identified in the TRB modeling review, and proposed TPB staff responses in the short-term, medium term, and longer-term;
3. The detailed TPB Work Program document prepared by TPB staff on December 24, 2003 in response to the TRB Committee’s request, with updates as of July 15, 2004 (shown in bold italics) to reflect comments received in the TRB Committee’s second letter report dated May 10, 2004.

Mr. Kirby reviewed in greater detail the third attachment that addresses issues raised by the TRB review panel with updates as of July 15, 2004 (shown in bold italics). The updates correspond to COG’s model development program application track activities:

#### 1.A Highway and Transit Validation

*Effort to date in the development of the Version 2.1D travel demand model has produced model estimation and validation results comparable to or better than those obtained with the Version 2.1C model, but with far fewer adjustment factors, due to the revised model structure and a more consistent definition of employment by TAZ which is one of the inputs to the model.*

#### 1. B Business and Commercial Trips

*The TRB Committee has urged TPB staff to expedite this effort. At the close of FY-2004, a consultant with specialization in this area has been retained to recommend methods for data collection. Technical memoranda have been prepared documenting count procedures, and TPB staff is planning to expedite data collection during FY-2005.*

### 1. C Bus Speeds in TPB Networks

*As part of the development of the Version 2.1D travel demand model, TPB staff is now implementing an adjustment to bus speeds in the forecast years to reflect the decline of speeds on major and minor arterials in the forecast year highway networks. A simple ratio of arterial travel times between base year and forecast year, stratified by jurisdiction and facility type (major and minor arterials) is being applied to bus route running times on these facilities to slow them down as well. Work is also underway to have a committee of transit professionals (similar to the group assembled for the Regional Bus Study) examine the potential for bus service expansion and bus priority treatments in the forecast years as the region grows.*

### 1. D Minimize the Use of Adjustment Factors

*At the close of FY-2004, substantial reduction in the use of adjustment factors had been accomplished, due to the introduction of a new freeway volume / delay function in the trip distribution model, a revised set of speed / volume lookup tables, and the adjustment of employment data by TAZ input to the modeling process to reflect a consistent definition for each jurisdiction. The Version 2.1C model contained 68 “K” factors. In the new Version 2.1D model there are only 52 “K” factors, and of these, 31 have been reduced in magnitude (i.e., the adjustment more closely approaches 1.0) from their values in Version 2.1C. As future improvements to the travel demand model are implemented, reviews will be performed to see if additional adjustment factors can be either eliminated or reduced in magnitude.*

### 1. E Speed Feedback

*One topic for special focus is the estimation of peak-period speeds for highly congested segments of the highway system. As noted in the following section on the emissions post-processor, the period specific traffic volumes provided by the travel model do not always match well with observed time-of-day distributions. Integration of the post-processor with the travel model may improve the representation of peak-spreading in the assignment process, which in turn may improve the representation of peak speeds. Using these new peak speeds in the speed feedback process may help ameliorate the problems encountered to date in cycling back through mode split in each iteration.*

### 1. F. Emissions Post-processor

*In its second letter report, the TRB Committee elaborated on its view that “the estimates of hourly volumes and speeds must be associated directly with the time-of-day (am, pm, off-peak) travel model output.” TPB staff responded that, as the TRB Committee noted in its analysis, the volumes assigned to the two peak three-hour periods and to the eighteen hour off-peak period by the travel model do not always match well with observed distributions. TPB staff decided in the first step of the post-processor to use the period-specific outputs of the travel model to group links into nine facility and peaking categories, and then to apply observed time-of-day distributions for the nine categories to 24-hour link volumes rather than to the period-specific link volumes. In this work plan, TPB staff will review approaches to time-of-day modeling and peak spreading in other areas, and investigate how the post-processor methodology can be integrated into the travel demand model so that the effects of peak-spreading are reflected in assigned peak and off-peak link volumes and speeds.*

**Item 4: Version 2.1 D Model (Update since May 21, 2004)**

Mark Moran distributed a handout entitled, “Status of the TPB Regional Travel Model, Version 2.1 D.” The model being presented today was Draft #28 of the Version 2.1D travel model. This model uses Round 6.4 land use forecasts that have been adjusted so that the definition of employment is consistent across all jurisdictions in the modeled area. Mr. Moran indicated that this model was being used in the Regional Mobility and Accessibility Study and that results were presented at the July 21 TPB meeting. The following changes were made to the Version 2.1D travel model between what was presented to the subcommittee at its last meeting in May (Version 2.1D Draft #18) and what was being presented today (Draft #28):

- Added a bus speed model that slows local bus speeds in the out years based on forecast highway congestion.
- Revised the method for developing walk-access-to-transit links.
- Statistically re-estimated the mode choice model to account for:
  - the revised walk-access links mentioned above.
  - Federal Transit Administration (FTA) guidelines regarding the ratio of out-of-vehicle-travel-time (OVTT) to in-vehicle-travel-time (IVTT) coefficients, i.e., OVTT/IVTT should equal 2.5.
  - Updated internal model year for costs – from 1980 to 1994, the calibration year.
- Updated highway toll modeling in the traffic assignment step.
- Used a fixed number of iterations (20) in the equilibrium highway assignment.
- Updated K-factors to reflect the aforementioned changes.

Mr. Moran stated that, as a result of a decrease in speeds of local bus with increasing traffic congestion, total estimated transit trips drop by about 1% in 2030. He presented the bus speed model in greater detail.

He presented the performance results of the draft #28 model for the years 1994, 2000, and 2030. One of the goodness-of-fit statistics presented was the percent root mean square error (RMSE) for link volumes, which is a measure of how closely estimate link volumes match observed link volumes (counts). The overall regional percent RMSE was 52% for 1994 and 47% for 2000. The percent RMSE for 2000 was about one percentage point better with the draft #28 model than it was for the draft #18 model presented in May to the subcommittee.

In conclusion, Mr. Moran noted that, even with the reduction in K factors (down from 68 to 52, of which 60 percent of the remaining factors were dampened) the draft #28 travel model is performing equal to or, in some cases, better than the model presented at the May meeting (draft #18 of Version 2.1D). He presented a table, reproduced below, showing the six issues raised by the TRB review panel and indicating how these issues were being addressed in the short term (i.e., possibly before this year’s air quality conformity analysis) and in the longer term.

Issue	Addressing issues raised by the TRB review panel		
	V 2.1D #28	Short term	Long term
1. Improving model validation	X		
2. Light duty commercial vehicles with NHB trips			X
3. Bus speeds	X		
4. Use of adjustment factors	X		
5. Speed feedback and mode choice		X	X
6. Hourly traffic volumes, speeds, and emissions estimation		X	

The Version 2.1 D model remains in draft as of July 23, 2004. Copies of the draft model will be available upon written request.

#### Questions and Comments

David Kline noted that Citilabs has just released version 3.2 of its TP+, Viper, and Cube software and asked what version of TP+ software is supported in the TPB Version 2.1D model. Mr. Moran replied that the TPB Version 2.1D model is supported with version 3.1 of TP+, not version 3.2.

Harry Sanders asked when the Metrochek transit subsidy will be reflected directly in the TPB travel model, as opposed to the current situation, where the subsidy is accounted for via a post processing procedure after the travel model is run. Mr. Hogan responded that the 2002 Metrorail Survey includes, for the first time, some information about the Metrochek subsidy. TPB staff will be working with AECOM to integrate that into the travel model.

Tom Harrington said he would like to get more information about the bus speed model, and wondered whether, in its current implementation, it was robust enough to model bus service that runs partially on arterial streets and partially on a separate right-of-way with bus priority.

Yuanjun Li asked whether 1994 or 2000 is used as a base year and the reason to update internal model year for costs from 1980 to 1994. Mr. Moran replied that the reason is to bring all costs in the model to the same year for consistency. Historically, that year was 1980 but is now changed to 1994, which is the calibration year. It is a bookkeeping issue.

Mr. Sanders asked whether the mode choice model suffers from an overly low value-of-time value. Mr. Moran responded that a previous draft of the Version 2.1D model (draft #18) did in fact have an overly low value-of-time value. This was caused when the value of the in-vehicle travel time (IVTT) coefficient was changed without statistically re-estimating the mode choice model. The reason for the change was to make sure the ratio of out-of-vehicle time to in-vehicle time was equal to 2.5, which is suggested by new FTA guidelines. TPB noticed the overly low value of time and performed a statistical re-estimation of the mode choice model. The new value of time for the home-based work mode choice model is 24% of the prevailing wage rate. According to recent guidelines by the FTA, the value of time for work mode choice models should be between 25% and 33% of the prevailing wage rate. Mr. Hogan added TPB staff is working with AECOM Consult to further advance transit modeling in the TPB travel model.

**Item 5.           Around the Table – Update on Regional Studies**

The chair asked subcommittee members around the table to provide an update on regional studies. Representatives from Fairfax County, Loudoun County, and the Virginia Department of Transportation provided subcommittee members updates on ongoing and planned studies. Mr. Kirby requested feedback on enhancements or corrections to the model from subcommittee members and consultants who have used the Version 2.1 D model. He said that staff needs to maintain close communications on regional studies, especially if there are major projects that need to be included in COG's analysis of air quality conformity.

Mr. Kirby responded to Harry Sanders request regarding the letter from Michael Replogle, dated July 8, 2004 and an attachment of June 15, 2004 by Norm Marshall of Smart Mobility, Inc.. The letter was addressed to the chairman of the National Capital Region Transportation Planning Board (TPB), and was distributed by Mr. Replogle at the July 9 TPB Technical Committee meeting. Mr. Kirby indicated that TPB staff, in a letter dated July 20, 2004, responded to each of the seven specific technical comments made in the letter. Copies of Mr. Replogle's letter of July 8 and the TPB staff response of July 20 were distributed to the TPB at its July 21 meeting and to the Travel Forecasting Subcommittee at today's meeting. Mr. Kirby encouraged subcommittee members to review both letters and provide TPB staff with any additional thoughts.

Finally, Chairman Bill Mann announced that this was his last meeting as chairman and thanked subcommittee members for their support during his term. Mr. Mann introduced Mona Sutton of MDSHA, who has accepted an invitation to serve as chairman of the subcommittee during FY-2005. Mrs. Sutton thanked Mr. Mann for serving as chairman of the subcommittee during FY-2003-2004 and presented him a certificate of appreciation.



COG/TPB Travel Forecasting Subcommittee  
Sign-in Sheet  
Meeting of July 23, 2004

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