Highlights of the TPB Travel Forecasting Subcommittee Meeting
Held on May 18, 2007

Item 1: Approval of March 23, 2007 Meeting Highlights

The highlights were approved as written.

Item 2: TPB Commercial Vehicle Model Development

Mr. Allen distributed copies of his presentation's slides together with his final report entitled, "Development of a Model for Commercial Vehicle Trips." A memorandum describing the TPB's data collection effort supporting the commercial vehicle (CV) model work was also distributed.

Commercial vehicles are defined as automobiles, light duty trucks, and vans that are used for non-personal transportation. These include vehicles associated with government services, private contracting, utility companies, and taxis, for example. The CV market does not include trucks, which are currently distinguished as Medium (2-axle vehicles with 6 tires) and Heavy (vehicles with 3 or more axles) in the TPB travel model. The CV market constitutes about 8% of the total vehicles observed on the highway system. Previously, the commercial vehicles were included as part of the NHB trip purpose. This is clearly undesirable given that commercial travel is substantially different from personal NHB travel, particularly with respect to modal usage.

Mr. Allen described his approach to the CV model calibration as one that "backs into" a final answer on the basis of observed traffic counts. He added that an O-D type survey was not considered for this project because it was viewed as too impractical for this particular travel market. Considerable effort was taken to ensure that commercial vehicles were properly and objectively counted during the data collection phase. (The identification of commercial vehicles involved some degree of visual judgment by the surveyor). Six-hour classification counts were taken at 148 locations in the region. The locations varied by facility type and area type, as distinguished in the regional highway network.

The calibration began with a 'starting' CV matrix that was generated using a borrowed trip generation and trip distribution model. Next, a synthetic CV trip table was generated on the basis of observed counts that were coded in the highway network. There are several ways in which a count-based matrix can be formulated. Mr. Allen used an iterative technique he designed called 'adaptable assignment'. The synthetic CV trip table is essentially one that, when assigned to the highway network, matches the observed CV counts very closely. The synthetic trip table was then compared to the starting trip table as a basis for modifying the trip generation model coefficients. Following this refinement, the O/D differences between the modeled and synthetic trips were largely small and random. Nonetheless, when the modeled trip table was assigned, the regional percentage RMSE was found to be large (95%). The final phase of the calibration was the formulation of a zonal adjustment (or 'delta') matrix so that the modeled matrix (using the refined trip generation model) would better match the observed counts when assigned to the highway network. It is important to understand that the delta matrix consists of small additive adjustments, and is used primarily to address random error in the modeled trip table. The 'final' CV model, therefore, consists of both the calibrated trip generation and distribution model along with the delta matrix. Mr. Allen added that the percentage RMSE of the final model was 23%.

The CV model has been combined into what is now the Version 2.2 model. Mr. Allen is now moving forward with the development of new truck models for the Washington, D.C. region.

The truck models will be combined into the regional model at some point during the next (FY-2008) fiscal year.

Questions and Comments

Mr. Hogan asked Mr. Allen how often the CV model should be updated. Mr. Allen replied that TPB should consider updating the model in the 5 to 10 year range. The TPB should ideally keep abreast of advances in GPS-based data collection techniques to inform such an update.

Ms. Li asked if special generator zones were considered. Mr. Allen replied that special generator locations were not considered for the CV model. Special generators will, however, be considered in the future truck modeling effort.

Mr. Replogle asked why taxis were combined into the CV trip definition, given that this market has distinctive characteristics. He added that electronic O-D data might be available for some taxi services. Mr. Zilliacus indicated that TPB requests to taxi providers for such data had not met with success. Mr. Allen suggested that a separate taxi model would have merit, but it would be very complicated to develop. Mr. Hogan commented that, the CV trip definition notwithstanding, the current CV model represents a major advance in TPB's modeling practice, given that commercial travel is now appropriately removed from the mode choice modeling process.

Mr. Griffiths asked Mr. Allen to describe the variation of commercial travel. Mr. Allen replied that the range of the CV travel percentage is about 3% to 16%. The trip generation model takes area type into account because it is a relevant factor. He added that the location with the highest observed proportion of commercial travel was Connecticut Avenue at K Street. This finding reflects the substantial presence of taxis, couriers, and other delivery-type vehicles that operate in the K Street vicinity.

Item 3: Version 2.2 Travel Demand Model Sensitivity Analysis

Ron Milone distributed a copy of his slides entitled "Version 2.2 Travel Model Sensitivity Analysis". Mr. Milone stated that the evaluation of the Version 2.2 model (released in draft last January) is currently ongoing and sensitivity testing has proceeded during the past two months. Although the TPB is currently responding to two requests for the draft model, he cautioned that the model may yet be modified based on ongoing analysis.

The sensitivity work focused on two 'dynamic validation' tests and a single future transit fare test. Dynamic validation refers to an assessment of travel pattern changes when a critical highway link is either modified or removed, for a base year condition. Two such tests were conducted: 1) the removal of the John Phillip Sousa Bridge and 2) a reduction of directional lanes, from 4 to 3, on the American Legion (Capital Beltway) Bridge. The transit fare sensitivity test involved altering the standard escalation assumption that fares will rise directly with inflation, to the assumption that fares will rise at *one-half* of the inflation rate.

Given that the responses to the dynamic validation tests are largely governed by the traffic assignment step, Mr. Milone reviewed some background information about this area with respect to the Version 2.2 model. One of the key refinements of the traffic assignment was the addition of a queuing function to the standard volume-delay function (VDF) used in the traffic assignment. The queuing function essentially imposes an additional time penalty (to a maximum of 14 minutes) to the restrained link time when the link V/C ratio is moderate to high. The queuing

function was not installed to more accurately reflect operational flow characteristics, but rather, was employed to eliminate a small number of hyper-congested links that were found to occur with the previous V2.1D #50 model.

The two dynamic validation tests resulted in small reductions in regional VMT. The Sousa bridge closure resulted in a regional VMT decrease of 200,000 (from a base of 144 million vehicle miles) and an increase of 4,000 transit trips (from a base of 985,000 total transit trips). The American Legion Bridge lane reduction resulted in a regional decrease of 500,000 vehicle miles, with no appreciable difference in transit trips. The decrease in VMT was determined to be reasonable, given that both tests effectively increase congestion and reduce highway accessibility. The Sousa Bridge removal resulted in increased transit ridership because of substantially worsened highway service in a corridor that is well served by transit. Bandwidth volume-difference plots indicated that shifts in travel patterns due to each alternative were reasonable.

When assuming that 2030 transit fares will grow at one-half the rate of inflation, as opposed to the standard assumption that fares will escalate directly with the rate of inflation, regional transit trips increased by 280,000, from 1.540 million to 1.820 million trips. Furthermore, the regional VMT decreased by 600,000, from 199.8 million to 199.2 million. Again, these results were deemed reasonable.

Questions and Comments

Mr. Jamei was concerned that the VMT reductions shown for the two bridge alternatives indicated were too small. Mr. Shapiro pointed out that the VMT reductions observed for both of the bridge alternatives indicated that travel times were increasing (the effect of added congestion along with a fixed F-curve). He suggested that more detailed trip distribution and mode choice difference summaries would be helpful in understanding the effects of the alternatives. He also added that summaries of both vehicle-hours and person-hours of travel would be desirable to have. Mr. Allen was surprised that the two bridge alternatives did not result in VMT increases due to traffic rerouting. Mr. Shapiro pointed out that traffic rerouting is reasonable as a short-term travel response to localized congestion. However, models are ultimately used to provide 30-year forecasts, which include longer term responses to congestion such as mode shifts and changes in resident and job location. At the regional level of analysis, the trip distribution and mode choice responses appear to have overwhelmed the effect of traffic rerouting, although the presence of rerouting is clear from the bandwidth plots.

Mr. Allen commented that since the queuing model is now applied on a link-by-link basis, the addition of a new node on an existing (congested) link will potentially result in added queuing delay. Mr. Milone agreed that the queuing function is now sensitive to network coding and, in general, link 'splitting' on freeways should be minimized for that very reason. Mr. Hogan commented that the queuing function has replaced the use of some modeling adjustments (bridge penalty times and K-factors), and this should be viewed as a major benefit.

Mr. Replogle commented that the direction of the sensitivity results appears plausible, although there is no firm basis for evaluating the reasonability of the magnitude of the modeled changes in travel. He suggested that the model could be validated by simulating a past year (such as 1996) and comparing the results to historical data. He suggested that spatial and temporal performance should be analyzed. He added that such a historical check of the model would also indicate how well the model is tracking with recent trends over time. Mr. Hogan cautioned that the historical (pre-2000) land use data is of questionable quality given that each new round of land use typically includes changes to past years as well as to forecast years. Mr. Replogle replied that the best

available historical information should be used. He added that, as a validation exercise, it is important to understand how well the modeled travel patterns perform over two points in time.

Mr. Milone cautioned that the quality of inputs to the model and the quality of the observed data have to be understood before the model performance can be gauged. Mr. Hogan added that threading a model though two points in time is not the purpose of the model. The model should be able to provide logical and reasonable sensitivity with respect to future policy questions being asked. The quality of the model inputs determines model performance, and the input data is subject to considerable variability. Mr. Griffiths added that Cooperative Forecasting data quality is a serious issue with respect to years prior to 2000. He cautioned that one year or more could be spent refining historical land use data so that it is consistent with what was developed for the year 2000. Mr. Shapiro commented that the models were never designed to simulate five years forward/backward in time. He added that model validation is necessary because we know that travel behavior changes over time. If the model has been validated in 2000, then the model can't be expected to match observed data from five years ago.

Item 4: Status Report on the Enhanced Arterial Highway Congestion Monitoring Program

Mr. Sivasailam and Ms. Morrow updated the Travel Forecasting Subcommittee on the status of the enhanced arterial highway congestion monitoring pilot program through use of a PowerPoint presentation. He described the steps undertaken in the route selection, choosing the hardware and software, solicitation of volunteers and the data collection protocol. He solicited volunteers from the TFS and mentioned that the system is being tested by COG staff.

Questions and Answers

In response to a question as to whether staff can tell the difference between a delay caused by incidents and signal delays, Mr. Sivasailam said yes, by detailed analysis of the data. Another member wondered how we would use the data if the volunteer travel route covered freeways and arterials. In response, Mr. Sivasailam mentioned that the data will be broken up into freeway and arterial components and analyzed accordingly. In response to a final question as to how many months in a year the data would be collected, he responded no decision as been made at this time.

Item 5: Update on the Household Travel Survey

Ms. Reschovsky reported that the 2007 Household Travel Survey is on track with regards to the schedule and the targeted response rates. Staff is finishing up the first quarter effort and starting the second quarter. Baltimore Metropolitan Council (BMC) has joined the survey, extending the survey area into Baltimore County, Baltimore City, and Harford County with 2,500 households across their region. Maryland SHA has also added on additional GPS households. The survey will continue until January of 2008.

Quarter 1 has yielded about 2,200 completed households, which meets the targeted response rate. Prince George's County is a little low, but a special effort is being made to bring up the response rate in the second quarter. Anne Arundel and Howard Counties were also a little low; however, the inclusion of BMC in the effort likely will increase participation in those counties.

An address-based list is being used instead of a random digit dialing strategy for the survey. This approach is a good choice, as cell phone-only households are responding. An article in USA

Today shows about 12% of households are cell phone only and about 25% of young households do not have a landline. This is consistent with staff findings in the pretest. Additionally, the effort has resulted in about a 7.5% response rate from households for whom there are no listed phone numbers. Generally, a direct mail campaign yields less than a one percent response. This is especially important because staff found that cell phone only respondents make 5 trips on average instead of 4 trips generally made by all respondents.

Staff is also starting up the Non-Response Follow-up Survey to find out about the types of households who did not respond. This includes putting non-responding households through a rest and recycle procedure. For households not contacted or who gave a soft refusal, staff waits about six weeks and then tries again to contact them. Subsequently, there is follow-up with a subset of the non-responders, trying to get a short 10-question survey from them either by phone or in person.

The next meeting of the TFS is scheduled for July 20, 2007.

COG/TPB Travel Forecasting Subcommittee
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Meeting of May 18, 2007

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